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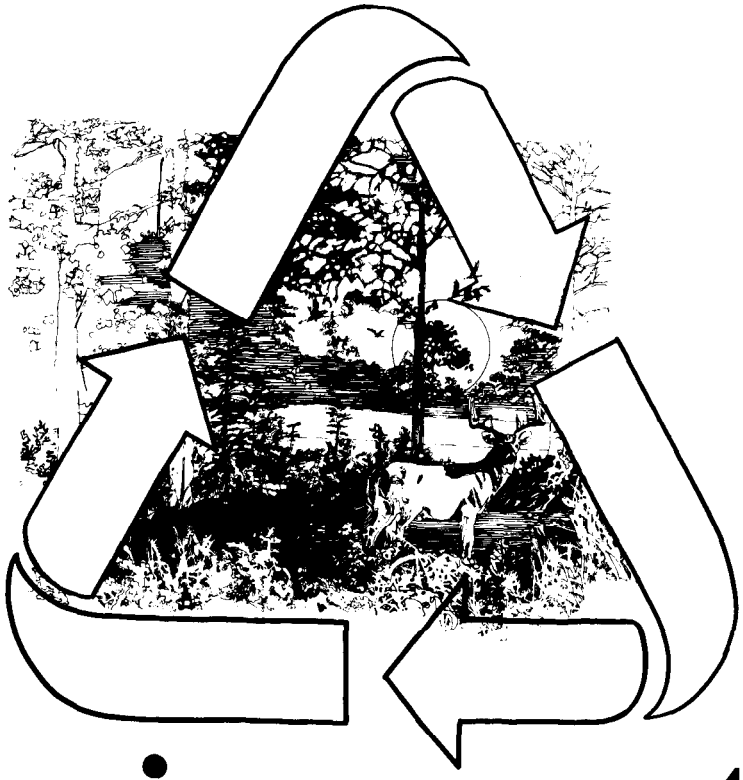

Environmental Contract Quality Management Guide

P-1071

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FOREWORD

The emphasis in this publication is the establishment of a "standard of quality" for the delivery of environmental services obtained by contract. The focus is on the quality of submittals/deliverables. It is not the intent of this guide to require additional contractual steps than those already required by the Federal Acquisition Regulations. If a simpler or more complex procedure than shown in this guide makes sense, then the user is encouraged to make the best quality and business judgement to achieve the desired end result, which is a quality product.

NAVFACENGCOM personnel involved in the preparation and execution of environmental contracts should have a thorough understanding of the requirements prescribed by the Environmental Protection Agency and the Federal Acquisition Regulations (FAR) and other pertinent Department of Defense and Navy directives concerned with the use and administration of environmental contracts.

Recommendations or suggestions that will improve this publication and its use should be submitted to the Commander, Naval Facilities Engineering Command, 200 Stovall Street, Attention: Code 022, Alexandria, VA 22332-2300.

This publication is certified as an official publication in accordance with SECNAVINST 5600.16A.

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ABSTRACT

The purpose of this publication is to establish quality objectives, establish criteria for review of data, and Quality Management (QM) program implementation objectives. The QM concepts, policies, and procedures addressed by this publication should standardize what Command personnel require from environmental contractors for all types of environmental contracts with special emphasis on the Comprehensive Long-Term Environmental Action, Navy (CLEAN) contracts. The publication provides guidance on formulating methods/procedures for assuring compliance with quality assurance provisions for deliverables. The duties and responsibilities of the contract administrator are discussed with respect to surveillance and monitoring contract performance within the scope of the contract.

This manual has been prepared for officers in charge, contracting officers, contracting officer technical representatives (COTRs), contracting officer representatives (COR), contract specialists, project managers, remedial project managers, design managers/engineers-in-charge, and officers in charge of construction.

CONTENTS

ENVIRONMENTAL CONTRACT QUALITY MANAGEMENT GUIDE

CHAPTER 1 INTRODUCTION

1-100 **PURPOSE.** This Environmental Contract Quality Management Guide has been developed to provide guidance to contract quality assurance personnel.

1-200 **SCOPE/APPLICABILITY.** This guide presents the policies, procedures, organization, and responsibility for the implementation of the appropriate level of quality management to ensure reliable results for deliverables for each environmental project or Contract Task Order (CTO). A "CTO" has been equated to "project" in this guide, and the two terms are used interchangeably. This manual applies to all NAVFAC contracts awarded to restore, maintain, or improve the environment or to comply with environmental laws and regulations. Its primary application is to the Navy's Installation Restoration Program (IRP) and various hazardous waste control and minimization (HWC&M) programs.

1-300 **BACKGROUND.** Environmental programs requiring contractor provided services are wide ranging. They include professional consulting services, design services (performance specifications development as well as detailed designs), and construction services. Most environmental projects are driven by federal, state and local regulations.

The largest volume of environmental projects executed by NAVFACENGCOM, both in total cost and number of contract actions, is in the Installation Restoration Program (IRP). In the IRP, potentially contaminated sites are identified generally through a Preliminary Assessment (PA) and confirmed through a Site Investigation (SI). The contamination and geologic conditions at the site is characterized and alternative remedial actions are considered during the Remedial Investigation/Feasibility Study (RI/FS). The Remedial Design/Remedial Action (RD/RA), based on the recommendations of the RI/FS, will contain and/or cleanup the contamination as negotiated with the various regulatory agencies.

Other environmental projects likewise involve studying a situation and constructing or modifying a facility or equipment to ensure environmental protection and compliance. Such projects include but are by no means limited to complying with Clean Air Act (CAA) requirements, ensuring safe drinking water standards are met, meeting water discharge limitations, managing hazardous materials and wastes, and protecting our natural resources. These all require continual monitoring to ensure compliance with existing requirements and improvements to meet new regulations or to ensure proper protection of our natural resources. When these services are performed by contractor, it is imperative that the contract administrator ensure that the contract clearly identifies the needs of the Department of the Navy, including quality assurance requirements.

1-400 **QUALITY ASSURANCE POLICY STATEMENT.** It is the policy of the Naval Facilities Engineering Command (NAVFACENGCOM) to provide quality services for the purpose of conserving, protecting and restoring our natural and cultural resources while accomplishing our military mission. NAVFACENGCOM will implement policies and procedures for ensuring that contractors are responsible for the quality, technical accuracy, and coordination of all services required under their contracts. In the satisfying of contractual obligations for the delivery of contracted environmental services, the contractor and the government quality assurance (QA) personnel will operate under quality assurance principles and practices which will achieve and document quality performance. Assuring cost-effectiveness without negating data quality or the quality of remedial actions will also not be compromised. Quality assurance will serve as a fundamental management tool ensuring that programmatic activities are conducted in a planned and controlled manner, reinforced by reliable documentation.

1-500 **QA PROGRAM IMPLEMENTATION.** NAVFACENGCOM recognizes that quality is best achieved through cooperative effort. The Command environmental contract QA program will be implemented by qualified contractor and government personnel with a commitment to quality on the part of each individual involved in the delivery of environmental services. The NAVFACENGCOM environmental contract QA program objectives are intended to ensure that all data collected are of known and documented quality. The data quality information developed with all environmental data will be documented and available in project files. All reported data will be accompanied by a calculation of precision and accuracy and, where appropriate, a statement of the completeness, representativeness, and comparability of the data. An active QA program will be maintained that ensures the production of quality data to achieve the goals established for each project undertaken. To accomplish this, the Command's environmental QM program will abide by the policies and procedures listed below in order to maintain effectiveness.

(a) Standard Operating Procedures (SOP) required by the appropriate regulatory agencies will be followed for all environmental data gathering activities; repetitive tests and measurements; and inspection and maintenance of facilities, equipment, and services.

(b) Corrective action will be required for situations that create a negative impact on the quality of data or related documentation or that renders the quality of a remedial design and/or construction activity indeterminate.

(c) QA reporting to the appropriate management authority will be instituted to ensure that early and effective corrective action can be taken when data quality falls outside of established data quality objectives.

(d) The development and implementation of internal controls will be instituted within the QA process in order to minimize corrective actions and prevent or reduce the likelihood of future nonconformances.

(e) QA issues or disputes that cannot be resolved between contractor and government QA personnel will be referred to the Contracting Officer for resolution. Direct channels of communication will be provided for this function.

(f) The intended use(s) of the data will be defined before the data collection effort begins, so that appropriate QA measures may be applied to ensure a level of data quality commensurate with the monitoring objectives. The determination of this level of data quality will also consider the prospective data needs of secondary users.

(g) Data quality objectives will be established to ensure the utility of monitoring data for its intended use. The intended data uses, level of quality, specific QA activities, and data acceptance criteria needed to meet the data quality objectives will be described in each quality assurance project plan (QAPP).

(h) Work performed of a substantive nature or identified as a significant deliverable, to the extent feasible and achievable, will undergo an independent technical review by experienced and qualified personnel. Independent technical review will be conducted in a variety of areas throughout the program, across all lines of management and involving all appropriate technical disciplines.

(i) Performance audits will be conducted to confirm adherence to QC and QA programs for the purpose of improvement.

(j) Contractor equipment and services will be monitored for performance in accordance with data quality goals established for environmental contracts.

(k) The Navy QA management function, to the extent resources are available, will be organized, funded, staffed and able to draw upon specific technical expertise as necessary to perform reviews and audits.

1-600 **COMPATIBILITY WITH OTHER GUIDANCE AND STANDARDS.** This guide is not intended to preempt other standards of quality management but to assist government quality assurance personnel in their duties where guidance is insufficient. One standard in particular that may impact this guidance is ANSI/ASQC-E4, *Quality* ***Assurance Program Requirements for Environmental Programs,*** currently in draft form. This guide (P-1071) does not prevent the Navy or any of its organizations from adopting the ANSI standard once it is finalized. This guide may be modified once the final ANSI/ASQC-E4 is published.

1-700 **GLOSSARY.** A glossary of key terms used in the Installation Restoration Program is provided as Appendix A. It is not intended to be a complete listing of all Navy and regulatory terms. It includes definitions for clarification of terms from a technical standpoint. Terms from Environmental Protection Agency (EPA) Guidance are used to the extent that they do not conflict with Navy-specific use, This glossary has been prepared to assist contract QA personnel in understanding the terminology used within this guide and by environmental contractors in their QC Management Plans and QA Project Plans.

1-800 **LIST OF ABBREVIATIONS.** A list of abbreviations is provided by Appendix B. The abbreviations are used in this guide or appear within environmental contract documents.

CHAPTER 2 PROFESSIONAL SERVICES QUALITY MANAGEMENT PROCEDURES

2-100 **BASIC PROCEDURES AND RESPONSIBILITIES.** In the implementation of a quality management plan, the contractor has certain functions, referred to as QC functions, and the Government has certain functions, referred to as QA functions. The combining and performing of both of these functions is referred to as quality management (QM), i.e., QC + QA = QM. The performance of quality assurance (QA) is the responsibility of the purchaser/user of the services. Despite this distinction, for resource, efficiency, or other reasons, the Government often purchases some QA services from the contractor. This is acceptable so long as the Government maintains its essential QA function. The Government's QA function/responsibility is to confirm through some objective method of evaluation that the quantity and quality of goods and services received conform to the contract requirements. The QA program is a part of a management system for planning, implementing, and assessing work to assure that the results satisfy stated technical administrative, and quality objectives. It includes written documentation showing the QA methods used to perform evaluations of the contractor's performance against some measurable criteria. QA is not a substitute for QC; a good QA program is paramount to measuring the effectiveness of the contractor's QC system. The contractor's QC function is to ensure that services provided in accordance with the contract are furnished in an accurate, precise and complete manner.

Almost every aspect of a project's planning and execution impact its quality management. Contractors should have a Quality Control Management Plan which delineates quality control and internal quality assurance requirements applicable to all projects and tasks. For project specific quality control concerns, the contractor should have a project specific quality control plan, called a Quality Assurance Project Plan (QAPP), as discussed in section 2-200. The contractor's QAPP should ensure that services are timely and representative of actual field conditions as per analytical data, sampling procedures, and field measurements. The implementation of these procedures should be enforced to avoid deficiencies in the quality of services or deliverables.

Included within the contractor's QC function/responsibility are:

(a) Providing and maintaining an adequate inspection system (acceptable to the Government) to insure that the desired level of quality output is maintained.

(b) Maintaining records of all inspection work, complete and available for review by the Government.

The scope of work (SOW) for the project should serve as a framework to facilitate the Government performance of its QA function and identify contractor QC requirements. A planned and systematic approach is needed in order to perform adequate QM. The approach should clearly identify QC functions to be performed by the contractor. The duties should be identified in the SOW with specific information as to the expected

standard of quality. The development of SOW for environmental projects is discussed in more detail in paragraph 2-400. Incorporated in the SOW should be requirements that foster the performance of contractor QC. The QC procedures incorporated in the SOW for environmental contracts should be specifically tailored to address the technical and procedural standards to be followed by the contractor to assure the quality of design data, laboratory reports, calculations, drawings/specifications and other deliverables. Specific procedures for assessing the quality of submittals/deliverables is addressed in paragraph 2-800.

The Government's interest on professional services contracts is protected by the EIC or COTR (EIC/COTR) assigned to the project. The EIC/COTR must be technically knowledgeable in the area of performance covered by the contract. For contracts such as the CLEAN from which contract task orders (CTOs) will be issued and for which one person is not sufficient to monitor contractor performance, EICs or Navy Technical Representatives (EIC/NTR) are assigned to support the EIC/COTR in providing technical direction/clarification and monitoring performance. Like the EIC/COTR, the EIC/NTRs must be technically knowledgeable in the area of performance covered by the CTO. When EIC/NTRs are required, a Lead EIC will be assigned as LEIC/COTR. The contract QA role and responsibility of the EIC/COTR and the EIC/NTR are addressed in more detail in paragraph 2-500 of this publication.

2-110 **Procedures Under CLEAN Contracts.** Under the Comprehensive Long-term Environmental Action, Navy (CLEAN) program, each prime A-E contractor is required to prepare a comprehensive Quality Control Management Plan (referred to by some CLEAN contractors as a Quality Assurance Program Plan). The plan describes the QC requirements applicable to all technical tasks in which documentation is developed or required in support of the Navy program. The objective of the plan is to ensure that appropriate technical and procedural standards are followed for all reports, field investigations, designs, drawings, and documentation. It addresses personnel training, procedural methods to be used, and the level of QC to be applied to tasks to ensure that the results and conclusions produced are accurate and reliable. For each CTO, the contractor is responsible for having a specific Quality Assurance Project Plan (QAPP). The objective of the QAPP is to ensure that the quality goals of the project will be met. It should not restate but be complementary to the overall QC Management Plan. In IRP studies, much of this is covered in the Work Plan which identifies the data quality required, the standard operating procedures to be followed, and the sampling and analysis requirements. The Work Plan should also detail QA/QC procedures to be used to document that the technical data generated during the execution of environmental contracts (e.g. Remedial Investigations/Feasibility Studies (RI/FS)) are accurate, precise, complete, and representative of actual field conditions.

The QAPP requires the contractor to appoint a Project Quality Assurance Officer (PQAO). The PQAO is responsible for ongoing review, monitoring, auditing, and evaluation of the field and laboratory QC/QA program. The PQAO is also responsible

for development and supervision of QC/QA procedures for data management, data analysis, report preparation, and report review. The PQAO functions in a capacity very similar to that of the QC Manager for conventional NAVFACENGCOM construction contracts under NAVFACENGCOM's construction quality management program. QC/QA problems or deficiencies identified by the PQAO during the review, monitoring, and auditing process are brought to the attention of the contractor Project Manager, as appropriate. Correction of QC/QA problems or deficiencies requiring corrective action is performed under the surveillance and monitoring of the Navy Engineer-in-Charge/Navy Technical Representative (EIC/NTR). The contractor may retain technical consultants to provide technical direction and review of programs and the analysis and reporting of project data.

It is important to reiterate that the buyer, the Navy, is responsible for assuring that it is receiving the appropriate quality product. Though the PQAO performs many QA functions, the LEIC/COTR or EIC/NTR is generally responsible for QA for the government including verifying that the contractor is conforming to its QC/QA plans and procedures, inspecting work in progress, and accepting or rejecting deliverables.

Similar roles and responsibilities exist when contract types other than CLEAN are used for environmental projects.

2-200 **QUALITY ASSURANCE PROJECT PLANS.** Environmental contractors should have documented their overall QC program approach in writing, perhaps as a Quality Control Management Plan (QCMP). This plan should identify common or central elements of their QC/QA program such as standardized approaches, methods, field SOPs, records management and document control systems, uniform cost and schedule controls, personnel training and qualification, etc. In addition, this plan should serve as the blueprint for project-specific Quality Assurance Project Plans (QAPP). A QAPP should specify QC/QA requirements for the task only and not duplicate the QCMP. Where the contractor does not have a separate, identifiable QCMP, the QAPP may need to discuss or adapt more general information, however, this should be avoided since it duplicates work and increases costs.

The QAPP is a site-specific planning document which should be required for every environmental project. The QAPP should ensure that the level of data quality is established before the project begins and that all data generated and processed will be of the quality and integrity established. As a result, periodic assessment of the quality of data generated should be conducted to ensure that all data are scientifically sound, of known and documented quality, and legally defensible, where appropriate.

Each QAPP should document the data quality objectives (DQO) or acceptance criteria for a project, identify the critical measurements to be performed, and discuss the quality assurance activities to be conducted during the sampling, analytical, and validation

phases of the project. QA Project Plans should be prepared in document control format, with provision for both a record of revision and a record of distribution.

The QAPP should be used at three fundamental points during the course of a project. These are:

(a) Project start-up allowing the project team an opportunity to prepare and review plans from a quality assurance viewpoint.

(b) During the project as a guide for real time quality assurance reviews and audits.

(c) Project close-out as a basis for determining whether the project attained the stated goals.

The contractor Site Manager should be responsible for preparing these plans. The contractor QC Manager (referred to by environmental contractors, and hereinafter, as their QA Manager) should provide assistance in the development of the plans, as necessary. The contractor's designated QA Coordinator, if applicable, also may be assigned to provide assistance in the development of these plans. The contractor QA Manager should provide input, recommend changes, and approve final QAPPs, prior to submitting the document to the Government for acceptance. If necessary, a technical review should be conducted for a plan using various types of expertise. The contractor QA Manager should maintain a current file of all approved QAPPs, associated Work Plans, and referenced SOPs. This file should be used to select specific projects for auditing the implementation of approved plans as appropriate or necessary.

Along with the Work Plan and QAPP, a Sampling Plan should be developed for discrete sampling events. These plans are complementary, presenting similar information but differing in the level of detail. Some information required in the QAPP should be provided in the Sample Plan. In those cases, the element in the QAPP should refer to the Sample Plan. The Sample Plan should be prepared according to local EPA regional guidance, as applicable.

In its guidance, ***Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,*** EPA QAMS-005/80, December 29, 1980, EPA established standard specifications for preparing QAPPs. This has been modified and clarified through further guidance, primarily, ***Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring*** (EPA OWRS QA-1, 1984) and ***Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA,*** interim final (EPA/540/G-89/004, October 1988). EPA Regions may have additional guidance and requirements.

A format for a QAPP, as outlined in EPA's ***Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,*** EPA QAMS-005/80, December 29, 1980, is as shown in Appendix D. Also in Appendix D is a discussion of the information recommended for inclusion in each section as provided in the same EPA guidance document.

2-300 **DATA QUALITY OBJECTIVES.** Data quality objectives (DQOs) should be developed in accordance with EPA and other applicable guidance for all environmentally-related measurement activities and incorporated into the QAPP. DQO is a planning process in which a graded approach is used defining a level of QA commensurate with the importance or intended use of the results of the work. These objectives should specify acceptance criteria for standard operating checks and balances used to evaluate and validate data based on parameters, such as precision, accuracy, representativeness, completeness, and comparability. Both technical and managerial consideration should be given to defining the criteria needed. The intent of DQO is to establish up front the degree to which total error in data results should be controlled to achieve an acceptable level of confidence in the decisions that are made from the data. DQOs should be accompanied by clear statements of:

(a) The decisions to be made.

(b) The need for environmental data.

(c) How data will be used.

(d) Time and resource constraints on data collection.

(e) Descriptions of the types of data to be collected.

(f) Specifications regarding the decisions to be made.

(g) Calculations that will be performed on the data to derive results.

2-400 **STATEMENT OF WORK.** The statement of work (SOW) should be as descriptive as practicable. The SOW should contain a detailed schedule for all deliverables and interim milestones with a start and finish date for the entire project, to the extent feasible. Due dates for the Implementation Plan, Project Reports, and other deliverables should be specified. Also, the SOW should detail any other reports required, such as a site-specific QA project plan, site-specific safety plan (to include activity hazard analysis for each phase of the operation), etc. With a vague SOW, the contractor may prepare an environmental study that will not be appropriate for its end use - to allow the Navy to make an informed decision as to which remedial action alternative to select for implementation at a contaminated site. Therefore the SOW must be specific as to what the EIC/NTR wants to see in a final study.

The EIC/NTR and the contractor's representative should be required to visit the site for the purpose of developing a complete understanding of all work that should be included in the SOW. The site visit discussions are not for negotiating a "level of effort". It is a "Fact Finding/Scoping Meeting". If the government estimate has already been completed, the site visit may assist in a mutual understanding of the minds regarding the level of effort.

The SOW should foster QC in the delivery of environmental contract services. The type of contract vehicle should be considered when incorporating QC procedures into environmental contracts, i.e. firm fixed price contract, cost reimbursement contracts, indefinite quantity contracts, etc. To the extent feasible, requirements fostering QC may be done once and made to apply to all SOW's issued. A standard requirement in the SOW should be the development and application of a QAPP in accordance with paragraph 2-200 of this guide. The following QC recommendations should be selected and tailored to fit specific project needs and included in the SOW, either as part of the QAPP or otherwise:

(a) Incorporate in the SOW, words crafted to ensure that the environmental professional services contractor is fully aware and conscious of the fact that he/she is responsible for the quality of deliverables achieved under his/her contract and will be held accountable. For example, define in the SOW the responsibility of the contractor for the precision, accuracy, representativeness, and completeness of all data. The environmental contractor responsibility statement, should include defining the contractor's responsibility for maintaining files of reports and studies and for ensuring that all data processing procedures are documented, routinely reviewed, and revised, if necessary. Require in the SOW that the contractor provide a description of the QC project staff, their technical qualifications, and assigned responsibilities. For CLEAN contracts, the foregoing requirement may have been included in the source selection plan as selection evaluation criteria and consequently should not be included in the SOW.

(b) Require in the SOW that the contractor develop a QC plan (generally a QAPP) that defines the scope of major activities, and the level of defensibility, documentation, and QC requirements for all environmental measurements. The SOW should require that specific QC procedures, as applicable, be applied for all major activities that produce or use environmental data. At times, the contractor may need to develop appropriate QC procedures prior to applying them. The plan should include measures for ensuring that all data meet good laboratory practices. For the Installation Restoration Program, this should include the requirements of the Navy's Lab QA program. The plan should describe the mechanism for identifying QC problems and expediting corrective actions.

(c) Require in the SOW that the contractor provide the Government (EIC/COTR), prior to data collection, a written plan specifying the acceptance criteria

for the quality of data. The plan should require the contractor to certify the quality of the data to the Government (EIC/COTR or the EIC/NTR).

(d) Require in the SOW that the contractor implement internal technical audits of all technical operations and that the Government (EIC/COTR or EIC/NTR) be notified of such audits. The audits may be required on a regular or random scheduled basis, depending upon the needs of the project. Require in the SOW that a copy of audit findings and documentation of corrective actions, as appropriate, be forwarded to the Government (EIC/COTR or EIC/NTR) for inclusion in the official contract files.

(e) Require in the SOW for CLEAN contracts and IQ contracts, as applicable, that the contractor fully implement the QC/QA provisions promulgated by the Quality Control Management Plan and the project specific QAPP, Sampling Plan, etc.

(f) Require that all QC/QA disputes that cannot be technically resolved at the working level between the contractor QA manager and the project EIC/NTR be forwarded to the EIC/COTR for facilitation of resolution through the Contracting Officer.

For CLEAN contracts, a copy of the completed SOW, Government Estimate (GE), and QA plan should be forwarded to the LEIC/COTR by the CTO EIC/NTR for an accuracy, completeness, and consistency review. As necessary, the LEIC/COTR should seek clarification and/or correction of the documents as appropriate. The LEIC/COTR should return the documents to the EIC/NTR for correction and forwarding to the EFD/EFA contracts department for approval and issuing the solicitation. The foregoing is also intended to satisfy the separation of functions required by the FAR.

2-500 OVERSIGHT.

2-510 **Technical.** The individual assigned the responsibility for technical oversight of a contract may be known as a Contracting Officer's Technical Representative (COTR), or a Lead Engineer-In-Charge (LEIC)/COTR for CLEAN contracts. When the surveillance and monitoring burden of the contract is significant, or it is not possible to have a single person who is qualified in all types of work needed to ensure adequate contract administration, Navy Technical Representatives (NTRs) may be appointed by the Contracting Officer, for the requiring activity, to assist the COTR. The requiring activity for the purpose of appointing NTRs is the office who originated the SOW. The NTR for CLEAN contracts is referred to as the EIC/NTR and reports to the LEIC/COTR. For Environmental Restoration contracts, the EIC is often referred to as the Remedial Project Manager (RPM).

The primary role of the COTR is to provide technical direction/clarification and monitor the contractor's performance within the scope of the contract. In the performance of COTR duties, the COTR should not take an action, either directly or indirectly, that

could change the pricing/cost or fee, quantity, quality, scope, delivery schedule, or other terms and conditions of the contract and/or delivery order. Because, every decision or action taken by the COTR on a cost-plus contract may impact the cost/fee or quantity, the COTR should coordinate such decisions with the Contracting Officer, as appropriate. The COTR appointment letter provides direction regarding the administration of a cost-plus contract and should be referred to for additional direction. On cost-plus contracts, the COTR should bring to the attention of the Contracting Officer any inefficiencies or wasteful methods being used by the contractor that may contribute to additional time, materials or labor hours.

The basic policy for COTR's for A-E contracts is explained in P-68, subpart 42.2 and applies to environmental contracts. SECNAV Instruction 4205.5 describes the authority of a COTR as "restricted to providing technical direction/clarification and administrative duties within the SOW, as assigned in writing by the PCO." The SECNAV instruction also warns that "the Contracting Officer shall avoid undue concentration of duties assigned to the COTR that could lead to abuse." The instruction indicates that if the COTR is responsible for originating the SOW, it is inappropriate to assign the COTR responsibility for the resulting work. Because the separation of functions may be difficult, the SECNAV instruction allows that certain functions be retained by the Contracting Officer, assigned to a different individual, or made subject to adequate supervisory controls. For the purpose of CLEAN contracts, the separation of the ordering function and inspection/acceptance functions is accomplished by requiring that the LEIC/COTR review and approve SOWs prepared by EICs/NTRs for individual CTOs. The individual selected to be the EIC/NTR on a CLEAN contract CT0 may be the EIC at the EFD administering the contract, an engineer at the activity where the environmental hazard is located, or, when actual remediation is involved, the OICC/ROICC responsible for construction at the activity under his/her AC0 authority will appoint the NTR. Generally one EFD LEIC is appointed for each CLEAN contract to supervise and coordinate the activity on all of the active CTOs and should be designated as the COTR. As the COTR, the LEIC, referred to herein as the LEIC/COTR, is the main point of contact for coordination with the contracts staff.

The EIC/COTR for IQ contracts, or the EIC/NTR for CLEAN CTOs as appropriate/feasible, should coordinate all contractor site visits and generally should act as liaison on site to maintain needed contacts and monitor contractor effort and procedures. The use of a third party to perform the QA oversight function should also be considered. The amount of time to be spent with the contractor on site should be planned as part of the review of the required work or implementation plan. Any deficiency observed during field monitoring which requires immediate attention should be reported to the EIC/COTR for IQ contracts, or the LEIC/COTR for CLEAN contracts as soon as possible. Follow-up visits should be made if the deficiency may effect the health and safety of personnel or have regulatory impacts. Documentation to the project/CTO file of all significant communication with and observation of the contractor is vital. This documentation provides the basis for later response to any

regulatory agency inspection or cost auditor who may question the actions being taken. It also provides assurance that the proper degree of oversight was present during the investigation and remediation of the environmental problem. The development of Field Monitoring Site Visit Reports and On-site Trip Reports should be considered to assist in reporting observations.

Contractor submitted monthly progress reports shall be reviewed by the EIC/COTR for IQ contracts, or by each EIC/NTR, to monitor performance on the projects/CTOs assigned to him/her. The review should include verification that:

(a) Activities planned and personnel utilized are appropriate and any problems noted are resolved.

(b) Activities are proceeding according to schedule or delays are satisfactorily explained, and reports and other deliverables are received when due.

At the completion of the foregoing, a comment or unofficial rating could be noted on the report to aid in later fee determination reviews. This review must also include, for CLEAN contracts, cost reasonableness as described in the NAVFACENGCOM CLEAN Contract Manual. The EIC/COTR or EIC/NTR should forward his report for inclusion in the project/CTO file. For CLEAN contracts the report should be forwarded to the LEIC/COTR for his/her coordination.

2-520 Cost. Cost oversight means surveillance of contractor's performance to determine if the percentage of work performed reasonably corresponds to the percentage of funds expended and alert the Contracting/ordering Officer of any perceived discrepancies. On cost reimbursement contracts, the COTR or NTR should periodically check contractor performance to ensure that the labor hours charged, as applicable, appear consistent and reasonable, and that any travel charged was necessary and actually occurred. Additionally, the COTR or NTR should periodically check contractor performance to ensure that the individual contractor employees are of the skill levels required and are actually performing at the levels charged during the period covered. Via the Contracting Officer (ordering officer) request assistance from DCAA as necessary. The COTR or NTR should also monitor and assess the quality of deliverables in conjunction with making recommendations for contractor monthly payments. Refer to the NAVFACENGCOM CLEAN Manual for additional guidance on cost oversight procedures. COTRs or NTRs for professional services contracts appointed by ROICCs under their ACO authority are also responsible for the performance of the foregoing duties.

2-600 **DELIVERABLES/SUBMITTALS.** The timing of contractual deliverables requiring Navy review should be staggered to regulate the workload and flow of information for review, approval, procurement, delivery and QC preparatory inspection of items before they are needed for design or construction. All required submittals

should be provided by the contractor to the Navy COTR, or designated NTR, in time to avoid delays in design or construction. Delays in the contractor's submittal process can also result in hurried and incomplete reviews and approval by the Government which may result in design or construction delays when data quality, materials or equipment fail to conform to specifications. These type delays can result in increased costs, both to the contractor and to the Government. Improper handling of submittals is normally attributed to the fact that procedures get overlooked in the rush of design or construction. Deliverables/Submittals are indispensable in assuring and controlling data, design or construction quality and should be given the required attention necessary to avoid delays and additional costs. The contractor should be required to maintain at the job site and up-to-date Contract Data Requirements List, DD Form 1423, for service delivery orders showing the status of all submittals required by the contract.

2-700 **DATA PROCESSING.** Data processing for environmental contracts should include five separate and distinct steps to ensure data integrity. These are: collection, validation, storage, transfer, and reduction. During the processing of data, precautions should be exercised in order to prevent the introduction of errors or the loss of data. The steps involved with data processing should be described in greater detail in the QA Project Plan. The cost for processing data should be a separate line item in the contractor's proposal. As such various steps may be negotiated based upon funding or other constraints.

2-710 **Data Collection.** Information sources that should be used to obtain data, include: Navy personnel and files; Federal, state, and local agencies; published and unpublished documents; knowledgeable personnel and contacts; and direct measurement or observation. Regardless of the source, sufficient documentation should be maintained to allow an independent evaluation of the data, including its source, validity, and quality. Information collected should appear in field logbooks, letters, meeting notes, telephone conversation records, memoranda, reports, and data collection forms.

Field data acquisition should be based, to the extent possible, on recognized standards and methods. These methods should be evaluated before and during application to verify accuracy, suitability, and repeatability. Field equipment used for data acquisition should be operated and calibrated in accordance with the manufacturer's instructions and Standard Operating Procedures. Monitoring systems and equipment used during project activities should be installed and maintained in accordance with the recommendations of the manufacturers of the system components and the design specifications of the system.

The activities related to sample collection, analysis, and reporting should be controlled in accordance with the approved Work Plan, Sample Plan and QAPP prepared for the site. Quality control procedures for these plans should be referenced from the contractors's applicable Standard Operating Procedures (SOPs) or Government supplied SOPs.

Information sources used on each project should be defined as primary, secondary, or tertiary. Primary refers to data provided by the Navy or collected by the contractor. Secondary refers to data collected by other contractors or government agencies. Tertiary refers to all other data sources. Data from secondary and tertiary information sources should first be evaluated; then, data gaps and inconsistencies should be identified. For work assignments involving the comparison of data, an evaluation should be made to ensure that the data are sufficiently similar in their characteristics. Additional studies should be conducted to fill data gaps and resolve any inconsistencies noted.

2-720 **Data Validation.** The process through which data should be accepted or rejected should be based upon specific data validation criteria. These criteria should be established in the individual QAPP as data quality objectives (DQOs). Personnel experienced with sampling and analytical protocols and procedures should perform the data validation in accordance with the established criteria and the intended use of the data. The data validation process should be reviewed by the contractor's QA Manager or QA Coordinator, as appropriate.

(a) Field Data Validation: The purpose of the validation process is to eliminate field data that are not collected or documented in accordance with specified protocols outlined in the QAPP and Sample Plan. In some instances, the field data should be used only for approximation purposes. In all cases, validation of field data should be performed on two separate levels. First, all field data should be validated at the time of collection by following the quality control checks outlined in the QAPP and Sample Plan. Second, field data should be validated by the contractor Site Manager, who will review the field data documentation to identify discrepancies or unclear entries. Field data documentation is typically validated against the following criteria as specified in the QAPP or Sample Plan, as appropriate:

(1) Sample location and adherence to the plan.

(2) Field instrumentation and calibration.

(3) Sample collection protocol.

(4) Sample volume.

(5) Sample preservation.

(6) Blanks collected and submitted with each respective sample set.

(7) Duplicates collected and submitted with each respective sample set.

(8) Sample documentation protocols.

(9) Chain-of-custody protocol.

(10) Sample shipment.

(b) Analytical Data Validation: All data generated by laboratory analysis of samples should be validated in accordance with quality control specifications outlined by the Naval Energy and Environmental Support Activity in the guidance document addressing chemical analysis. Three analytical levels for quality control are outlined in item 17 of Appendix C that correspond to data validation specifications. The specific level required for a work assignment will be identified in the QAPP. When Contract Laboratory Program (CLP) criteria are followed, validation will be in accordance with EPA guidance documents items 8 through 11 of Appendix C. In all cases, laboratories performing sample analysis for the Installation Restoration (IR) program should have prior approval by the Navy as required by item 17 of Appendix C.

Analytical data documentation should be validated against the following criteria as specified in the QAPP or Sample Plan, as appropriate:

(1) Chain-of-custody protocols and documentation.

(2) Sample condition upon arrival at the analytical laboratory.

(3) Analysis date versus applicable sample holding times.

(4) Frequency of quality assurance and quality control analysis.

(5) Laboratory blank contamination.

(6) Laboratory accuracy (percent recovery versus control limits).

(7) Laboratory precision (relative percent difference versus control limits).

The purpose of the validation process is to eliminate unacceptable analytical data, and to designate a data qualifier for any data quality limitation discovered. In some instances, the analytical data may be used only for approximation purposes. Data validation summary reports should be filed with the data and should describe the usability of the data for further technical interpretations.

2-730 **Data Storage.** The storage of data takes different forms, depending upon how the information is generated. The use of bound log books with numbered pages is the preferred method for recording observations. In addition, notebooks of completed data forms should be maintained in Project files. Specific plans for data storage appropriate to each work assignment should be addressed in each QA Project Plan. Items that should be considered are media, conditions, location, retention time, and access.

2-740 **Data Transfer.** Each QA Project Plan should describe the methods used to ensure that data transfer is error-free (or has an admissible error rate), that no information is lost in the transfer process, and that the input is completely recoverable from the output. In order to reduce the risk associated with data transfer, this process should be kept to a minimum.

Some environmental data is procured from laboratories or other sources on magnetic media. These data are normally analyzed using a computerized data management system. Data received in hard copy form is entered in the system manually. The following data verification steps are typically used by contractors when entering data manually into the system.

(a) Technician input of data to the system.

(b) Check and edit by the entering technician.

(c) Independent transcription check of a representative number of entries (approximately 10%) by a second technician who did not participate in the original entry.

(d) Edit and re-enter inaccurately transcribed data.

(e) Reasonableness check of the data base by the Site Manager. The results of this step will determine whether additional verification is required.

(f) Data base is determined complete and ready for analysis.

2-750 **Data Reduction.** Each QAPP should outline the methodology and reference procedures for ensuring the correctness of the data reduction process. The procedures should describe steps for verifying the accuracy of data reduction. Data should be reduced either manually on calculation sheets or by computer on formatted print-outs. The following are examples of responsibilities delegated in the data reduction process:

(a) Technical personnel should document and review their own work and are accountable for its correctness.

(b) Major calculations should receive both a method and an arithmetic check by an independent checker. The checker will be accountable for the correctness of the checking process.

(c) An Independent Technical Review should be conducted to ensure the consistency and defensibility of the concepts, methods, assumptions, calculations, etc., as scheduled by the Site Manager.

(d) The Site Manager should be responsible for ensuring that data reduction is performed in a manner that produces quality data through review and approval of calculations.

2-760 **Hand Calculations,** All hand calculations should be recorded on calculation sheets and should be legible and in logical progression with sufficient descriptions. Major calculations should be checked by an engineer or scientist of professional level equal to or higher than that of the originator. After completing the check, the checker should sign and date the calculation sheet immediately below the originator. Both the originator and checker are responsible for the correctness of calculations. A calculation sheet should contain the following, at a minimum:

(a) Project title and brief description of the task.

(b) Task number, date performed, signature of person who performed the calculation.

(c) Basis for calculation.

(d) Assumptions made or inherent in the calculation.

(e) Complete reference for each source of input data.

(f) Methods used for calculations.

(g) Results of calculations, clearly annotated.

2-770 **Computer Analysis,** Computer analysis include the use of models, programs, data management systems, etc. For published software with existing documentation, test case runs should be periodically performed to verify that the software is performing correctly. Both systematic and random error analysis should be investigated and appropriate corrective action measures taken.

For in-house developed models and programs, documentation should be reviewed by the Site Manager prior to use. This documentation should be prepared in accordance with computer program verification procedures and should contain at a minimum:

(a) Description of methodology, engineering basis, and major mathematical operations.

(b) Flow chart presenting the organization of the model (or program).

(c) Test case(s), sufficiently comprehensive to test all model (or program) operations.

Quality control procedures for checking models (or programs) should involve reviewing the documentation, running the test case, and manually checking selected mathematical operations. Each computer run should have a unique number, date, and time associated with it appearing on the printout. All quality control measures should be documented as referenced in applicable procedures.

2-800 **DATA QUALITY ASSESSMENT.** Each contractor should be required, by use of a QAPP or other means, to describe how all data generated will be assessed for accuracy, precision, completeness, representativeness, and comparability. This data should be accompanied by a calculation of accuracy and precision, and where appropriate, a statement on completeness, representativeness, and comparability. Each of the data quality assessment parameters are discussed herein.

2-810 **Precision.** Each Contractor's explanation should contain various approaches to demonstrate the reproducibility of the measurement process. The following techniques are sometimes used to ensure precision:

(a) Replicate Samples. Replicate sample data be within predetermined acceptance limits.

(b) Collocated Samples. Sample data from collocated sampling points be within predetermined acceptance limits.

(c) Inter/Intra Laboratory Testing. Sample data from independent performance evaluations be within predetermined acceptance limits.

(d) Instrumental Checks. Each measurement device have routine checks performed to demonstrate that variables are within predetermined limits. The types of variables that are checked are zero, span, noise levels, drift, flow rate, pressure rate, and linearity.

2-820 **Accuracy.** Each Contractor's explanation should contain various approaches to demonstrate that reported data are favorably comparable to the true value(s). The following methods are sometimes used to ensure accuracy:

(a) Traceability of Instrumentation. Each measurement device is assigned a unique identification number. Documentation should identify the specific measurement device, where and when used, maintenance performed, and the equipment and standards used for calibration.

(b) Traceability of Standards. Each standard and measurement device is compared against a standard of known and higher accuracy (where possible). All calibration standards should be traceable to the National Institute of Standards and Technology or other primary standards organizations.

(c) Traceability of Samples. Each sample is assigned a unique sample identification number to be used along with documentation that further describes characteristics about the sample.

(d) Traceability of Data. Data is documented to allow complete reconstruction, from initial field records through data storage system retrieval.

(e) Methodology. If available, Federal reference, equivalent, or approved alternate test methods of known accuracy are used. For very critical work, two independent analytical methods should be used to verify accuracy.

(f) Reference or Spiked Samples. Recoveries is within predetermined acceptance limits.

(g) Performance Evaluation. Each environmental monitoring program use samples having known concentrations of constituents to be analyzed as unknowns in the laboratory for comparison. Known and analyzed concentrations should compare within the predetermined acceptance limits.

(h) Equipment Calibration. Calibration of equipment is conducted in accordance with manufacturer's instructions and SOPs, particularly in terms of frequency and environmental changes, such as temperature.

2-830 **Completeness.** Each contractor's explanation should identify the quantity of data needed to support the objectives established for a particular investigation or a series of sampling rounds. Acceptance criteria should be developed that specifies the completeness requirements for data. Completeness should take into consideration environmental conditions and the potential for change with respect to time and location. The following methods are sometimes used to ensure completeness:

(a) Field instrumentation and equipment are examined to determine if they are functioning properly and are calibrated in accordance with applicable procedures.

(b) Precautions are taken to insure that all data is recorded accurately and legibly.

(c) Designated locations are sampled and measured for all the specified parameters within the predetermined acceptance limits.

(d) Sufficient sample volume is obtained to complete the specified analysis.

(e) Field and laboratory quality control samples are included with each sample set as specified.

(f) Insure that sample sets represent all possible contamination situations under investigation.

2-840 **Comparability.** Each contractor's explanation should contain various approaches to ensure the comparability of data by addressing the following, to the extent applicable:

(a) Consistency of reporting units.

(b) Standardized siting, sampling, and analysis methods.

(c) Standardized data formal.

2-850 **Representativeness.** Each contractor's explanation should contain various approaches to ensure that all samples collected represent the media sampled and characterize the environmental conditions under study by addressing the following, to the extent applicable:

(a) Purpose for Sampling. Each sampling location should have an established and documented purpose.

(b) Location Description. Each sampling location is specifically identified by a location description and by suitability to meet the purpose for sampling.

(c) Sampling Conditions. The conditions under which each sample was collected is described. Conditions include such items as stream flow rate, wind speed and direction, temperature, precipitation, etc.

2-900 **CORRECTIVE ACTION.** Provisions for establishing and maintaining data quality control reporting to the appropriate contractor management authority should be required to be instituted by the contractor. The provisions should be formulated to ensure that early and effective corrective action will be taken when data quality falls outside of established data quality objectives (acceptance criteria). In addition, the contractor should explain, by use of a QAPP or by other means, how he/she will keep the COTR informed of the performance of data collection systems. The contractor's formulation of data quality corrective action provisions should involve the following steps:

(a) Identification of the responsible party.

(b) Schedule of corrective action.

(c) Review of the corrective action taken.

(d) Confirmation that the desired results were produced.

The establishment of a data quality control process is intended to minimize corrective actions through the development and implementation of internal controls procedures. To accomplish this, contractors should establish procedures for each measurement system to activate a corrective action when acceptance criteria have been exceeded. In addition, reviews and audits should be conducted by the contractor on a periodic basis to supplement the procedures. Results of quality assurance reviews and audits typically identify the requirement for a corrective action. A corrective action plan should be prepared by the contractor to include: identification of the corrective action; organizational level responsible for the action taken; steps to be taken for correction; and approval for the corrective action.

A corrective action request form (Figure 1) should be required to be used by contractors to initiate and document all data quality corrective actions. A corrective action status form (Figure 2) should be used by contractors to monitor the status of all corrective actions. Copies of corrective action forms should be provided to appropriate contractor management authorities and an information copy forwarded to the COTR. Forms, Figures 1 & 2, are acceptable for providing the information requested. These specific forms are not required, any other format is acceptable but should contain at a minimum the same information.

Corrective action is not complete until the problem has been solved effectively and permanently. Follow-up action to ensure that the problem remains corrected is an important step in the corrective action process. The contractor quality manager should have the authority to require environmental measurements that are compromised to be discontinued or limited until corrective action is complete and data quality in no longer questionable. The contractor QM should also have the authority to order the reanalysis of samples or measurements occurring since the last documented evidence that a corrective system was in effect. The COTR should monitor contractor performance of the foregoing procedures and implement appropriate corrective action to negate nonconformance.

The primary controls used to assure quality data and products typically involve the following steps that are described further in subsequent sections.

(a) Conducting audits.

(b) Identifying nonconformances.

(c) Implementing corrective action.

(d) Verifying actions taken.

FIGURE 1

Corrective Action Request
Form (Page 1 of 2)

Project Number _____

Location: _____

To (Project Manager): _____

From (Reviewer): _____

Date: _____

Description of Problem: _____

_____

_____

_____

_____

Corrective Action Requested: _____

_____

_____

_____

_____

The above corrective action must be completed by _____

Corrective Action Taken: _____

_____

_____

FIGURE 1

Corrective Action Request Form

(Page 2 of 2)

Project Manager: _____
(Subcontractor QA Manager)

Acknowledgement of Receipt

_____
(Date/Initial)

Correction Action Completed

_____
(Date/Initial)

Reviewer:

Corrective Action is/is not satisfactory

_____
(Date/Initial)

Remarks: _____

QA/QC Coordinators

Corrective Action is/is not satisfactory

_____
(Date/Initial)

Remarks: _____

cc: Program Manager
Program QA Manager

QA/QC LEVEL _____ PROJECT NO.

PROJECT MANAGER _____ STATUS AS OF (DATA): _____

CA#	BRIEF DESCRIPTION	ORIGINATOR INITIALS AND DATE	DETERMINATION AND IMPLEMENTATION				EFFECTIVENESS	
			INITIAL	DUE DATE	INITIAL	DUE DATE	DUE DATE	"POKE DATE

PROJECT QC MANAGER SIGNATURE/DATE

FIGURE 2
QA Corrective Action Status Report

2- 1000 **AUDITS.**

2-1010 **Conducting Audits.** Audits should be conducted as the principal means to determine contractor compliance with the contract quality management program as established by procedures such as, Contractor's Quality Control Program Plan, the site-specific Quality Assurance Project Plans, Sample Plans, and Data Quality Objectives. The use of the foregoing procedures depend upon the type of environmental contract awarded. Audits should be used to review the actual performance of the overall program (as applicable), and individual projects, during their course and across all levels of management. The contractor QC Manager should have the primary responsibility for conducting audits, and the authority to delegate certain audit functions to designated contractor QC/QA Coordinators, as necessary.

The contractor's quality management program should require that an adequate level of auditing be performed throughout the program and the individual projects. Different types of audits depending upon the objective of the audit should be used to verify that measurement systems are operating properly, to assess whether data quality is adequately documented, and to evaluate the management effectiveness of the quality assurance program. The choice and type of audit should be based on applicable regulations, project scope, scheduled tasks, program guidance, and emergency conditions. The four types of audits that should be used by the contractor to determine whether the work is being performed in conformance with requirements are as follows:

(i) Performance audits to determine the status and effectiveness of measurement systems.

(ii) Technical system audits to confirm the adequacy of the data collection systems.

(iii) Data quality audits to assess the effectiveness and completeness of documentation of data collection activities.

(iv) Management system audits to evaluate the abilities of contractor Program and Site Management to meet mandated data collection and data quality objectives.

Audits should be conducted by the contractor QC Manager or designated QC/QA Coordinator, portions of which may be delegated to an auditing team comprised of senior technical specialists. These specialists should be familiar with the technical and procedural requirements of both field and laboratory operations, and the associated quality assurance plans. In addition, auditors should not be directly involved with the actual tasks themselves, so as not to introduce bias in the auditing process.

An audit should be initiated by the contractor QC Manager or QC/QA Coordinator when one or more of the following conditions occur: to determine the capability of a potential subcontractors' quality assurance program prior to the award of a subcontract; after the award of a subcontract; to assess a newly-instituted quality assurance program; when reorganization or major revision has been made to QA Project Plans; to confirm development of SOPs or other controlling documents; when scheduled audits are established by the program; at any time a nonconformance is suspected; and to verify that corrective actions for nonconformance have been executed.

A SOP for conducting audits which describes all steps of the audit should be required to be instituted by the contractor. The procedure should include provision for scope, schedule, checklist, findings, nonconformance reports, corrective action, follow-up review of the corrective action, resolution of conflicts, and stop work notices.

The procedure for conducting audits should be in place when the contractor QC Manager serves as, or appoints an independent QC/QA Coordinator to be in charge of the specific audit. The Auditor should subsequently arrange an introductory meeting to identify the audit personnel, define the scope of the audit, and describe the audit plan and schedule. The Auditor should lead the audit, evaluate all findings contributed by the audit team, identify nonconformances or deficiencies, prepare the audit report, and initiate corrective action, if necessary. Checklists should be developed by the contractor to ensure that the audit follows established procedures and covers the established scope.

The contractor QC Manager should submit a notice of any laboratory or field system audits (described below) prior to their occurrence and in a timely manner to the cognizant COTR. The audit should be scheduled such that the COTR may attend and observe the audit. Following the audit, a copy of the audit report will be transmitted to the COTR.

(a) A systems audit of field procedures should be conducted to assess and document, at a minimum, sampling methods (including collection, containers and preservation), personnel and equipment decontamination, safety and health procedures, sample shipment documentation, quality control methodology, pre-field activities, equipment check-out and calibration, sampling utensils and container preparation, post-field activities, sampling documentation and other field activity logs, field team debriefing, and equipment check-in and recalibration.

(b) A systems audit of laboratory procedures should be conducted to assess and document, at a minimum, methods for: data validation, analytical data generation, chain of custody documentation and protocol, instrument calibration, data reporting, and quality control.

2-1020 **Identifying Nonconformances.** Activities subject to quality control/assurance should be evaluated for compliance with applicable quality control and quality assurance

procedures. For CLEAN contracts, the performance of both the QC and QA functions are performed by the CLEAN contractor, with oversight provided by Government QA personnel/COTR. Refer to your field activity CLEAN contractor's QCMP for specific information on how clean contractors perform their QC and QA functions. For indefinite quantity (IQ) contracts, the A-E contractor is responsible for performing the QC function and the QA function should be performed by Government QA personnel/COTR. A lack of contractor compliance with QC procedures constitutes a nonconformance. For CLEAN contracts, the contractor QC Manager, QC/QA Coordinator, or any staff member who discovers or suspects a nonconformance, is responsible for initiating a nonconformance report and should be required by the SOW to submit a copy of nonconformance reports to the designated Government QA person/COTR. The affected contractor QC manager should ensure that no additional work, which is dependent on the nonconforming activity, be performed until a confirmed nonconformance is corrected. Government QA personnel/COTR should be kept fully informed regarding nonconformance matters and should monitor the contractor's performance of his/her QC functions.

Procedures describing the reporting, evaluation, and correction of nonconformances which are discovered during the contractor's internal audit process or during the course of project work should be implemented by the contractor. In addition, internal program controls should be developed and used to minimize the potential for nonconformances. This involves action taken by contractor Program Management to prevent the recurrence of identified nonconformances using a feedback loop established by reports submitted to management. Government QA personnel/COTR should monitor the performance of the foregoing contractor QC responsibilities. Also, nonconformance items should be considered as input items for award fee determinations.

2-1030 **Implementing Corrective Action.** Nonconformances should be reported to the contractor QC Manager, to the affected manager, the audited entity and to the Government QA person/COTR. Each affected manager should be responsible for evaluating all reported nonconformances, conferring with the contractor QC Manager on the steps to be taken for correction, and executing the corrective action as developed. No rework should be initiated without a decision made by the Contracting Officer or the person delegated by the Contracting Officer. In addition, the contractor QA Manager should maintain a log of nonconformances in order to track their disposition until correction. All documentation associated with the nonconformance and corrective action should be entered into the project/contract files. The Government QA person/COTR should be provided, upon request, with a copy of the log of nonconformances for monitoring the implementation of corrective actions by the contractor.

Corrective action measures should be selected by the contractor to prevent or reduce the likelihood of future nonconformances and address the causes to the extent identifiable. Selected measures should be appropriate to the seriousness of the nonconformance and realistic in terms of the resources required for implementation.

2-1040 **Verifying Actions Taken.** For CLEAN contracts, upon completion of the corrective action, the contractor internal Auditor should evaluate the adequacy and completeness of the action taken. If the action is found inadequate, the contractor QA Manager, Program Manager and affected manager should confer to resolve the problem and determine any further actions. Implementation should be initiated by the affected manager, and completed by the audited entity. The contractor QA Manager should issue a stop work notice in cases where corrective action was not completed as planned. The COTR should be notified in a timely manner prior to project termination. If the corrective action is found to be adequate, the contractor internal Auditor should notify the audited entity of the satisfactory corrective action, and the contractor QA Manager of the completion of the audit. The contractor QA Manager should be responsible for reviewing all audit and nonconformance reports to determine areas of poor quality or failure to adhere to established procedures. A copy of contractor audit results as shown in figure 3, or other form same information, should be submitted to the COTR. The COTR should monitor the execution of the foregoing verification procedures.

2-1050 **External Audits.** In addition to the internal audit procedures described above, external performance and/or systems audits should periodically be performed by representatives of the Navy Contracting Officer. Field performance audits should be conducted to evaluate the execution of sample identification, sample control, chain-of-custody procedures, field documentation, and sampling operations. External system audits should consist of an evaluation of both field and laboratory quality control procedures to determine their proper selection and use. External audits are also scheduled to check the performance of internal performance and system audits.

2-1060 **Audit Scheduling.** Internal and external audits should be scheduled on the basis of the complexity, status, and importance of the item or activity subject to audit. Each organization performing quality affecting activities should be audited at a frequency which ensures compliance with the appropriate elements of the QM program. Internal and external audits should be performed at least annually (or one time for each project lasting less than one year). Additional, unscheduled random audits or special audits should be considered when one of the following conditions exist:

(a) A declining trend in quality performance;
(b) Significant changes are made in functional areas such as reorganization or procedural revisions;
(c) Questionable performance of quality control/quality assurance activities;
(d) Implementation of a corrective action;
(e) Changes in the SOW;
(f) Requirements for systematic and independent assessment of quality control/quality assurance program effectiveness;
(g) Significant changes in the Quality Management program; and
(h) Formal request for a quality management audit submitted by a contractor quality program manager or Navy Contracting Officer.

FIGURE 3

Audit Report

Project No.: _____ Project Manager: _____

Date of Audit: _____

Auditor: _____

Brief Description of

_____

_____

_____

Audit Summary:

_____

_____

_____

Corrective Action Required:

_____

_____

_____

Remarks:

_____

_____

_____

Auditor Signature: _____ Date: _____

2-1100 **IMPLEMENTATION REQUIREMENTS AND SCHEDULE.** The contractor QC Manager (referred to by the contractor as his QA manager), in concert with the contractor Program (Project) Manager, is responsible for the successful implementation of the Quality Control Program for CLEAN contracts and other HWC&M programs where the contractor has responsibility for the performance of QC and QA functions. Table 1-1 outlines the typical requirements and corresponding schedule of the major quality assurance components of the CLEAN program. Fundamental components that provide control for the successful implementation of the quality assurance program are the audits. As a result, the discussion above on the scheduling of audits further elaborates on Table 1-1. To ensure that personnel in different monitoring programs can effectively develop and implement programs, perform activities, and resolve problems in a consistent, efficient, and cost-effective manner, contractors should be required to develop communication procedures. Table 1-2 presents the quality control/quality assurance communication requirements which are typically implemented for the CLEAN program. These QC/QA communication requirements are provided for assistance in understanding and facilitating communications on environmental contracts. The requirements should be used as a guide in monitoring the contractor's development and insuring of communication procedures.

2-1200 **DESIGN SERVICES,** This paragraph discusses the requirements for professional services related to remediation design services. For CLEAN contracts and other similar contracts, the contractor is responsible for design project quality control and quality assurance on all design reviews, with assistance from subcontractors, as necessary. The COTR should monitor the performance of this function. The quality and continuity of design drawings and technical and standard specifications are the keys to optimizing delivery of the constructed project. Design does not normally refer to site inspections, site characterizations, remedial investigations or similar types of projects. Specifications for these types of projects should be presented in Work Plans, Sampling and Analysis Plans, Quality Assurance Project Plans, and Health and Safety Plans as discussed herein.

When the professional services contractor has responsibility for the QC and QA functions, i.e. CLEAN and similar type contracts, he/she should conduct the project design reviews in conjunction with standard professional practice of continuous design review. For contracts where the contractor has only responsibility for QC, these functions should be conducted by the COTR.

Table 1-1

Implementing Requirements and Schedule

Requirement	Responsibility	Schedule
Qa Program Plan	QA Manager	Draft within 30 days of contract award. Final within 15 days of review comments. Annual revisions, as appropriate.
QA Projects Plan and Sample Plan	Site Manager and QA Coordinator	Specified by the Work Assignment; otherwise, draft within 30 days of work assignment receipt. Final within 15 days of review comments.
QA Status Report	QA Manager	Semi-annually following award of contract.
QA audits	QA Manager and QA Coordinator	Scheduled for each audited entity identified, or as needed,
Standard Operating Procedures	Program Manager and QA Manager	Ongoing, as needed, or identified by audits.

TABLE 1-2

QUALITY ASSURANCE COMMUNICATION REQUIREMENTS

DOCUMENT	RESPONSIBLE INITIATOR	REPORT RECIPIENTS (MINIMUM)	HOW OFTEN ISSUED	REVIEW REQUIREMENT	WHO WILL TAKE FOLLOW-UP ACTION (As NECESSARY)
1. QA Program Plan	QA Manager	Program Manager QA Manager Navy Contracting Officer Navy Project Officer Navy QA Officer	Following contract award and revisions thereafter	Program Manager Navy Project Officer Navy QA Officer	QA Manager
2. QA Project Plan and Sample Plan	Site Manager and QA Coordinator	Site Manager QA Manager QA Coordinator Navy Project Officer Navy Remedial Project **Mgr.** Navy QA Officer	One for each project assignment and revision thereafter	QA Manager Navy Remedial Project **Mgr.** Navy **QA** Officer	Site Manager
3. Performance and Systems Audits	QA Manager and QA Coordinator	Site Manager QA Manager QA Coordinator Navy QA Officer	Per each audited entity	QA Manager QA Coordinator	Site Manager
4. QA Status Report	QA Manager	Program Manager Navy Project Officer Navy QA Officer	Semiannually	None	QA Manager
5. Standard Operating Procedures	Program Manager and QA Manager	Program Manager QA Manager QA Coordinators Site Managers Navy QA Officer	Initial, then revisions thereafter	Program Manager and QA Manager	Program Manager and **QA** Manager

2-1210 **Design Process.** The design process should be prescribed and activities documented on a timely basis and to the level of detail necessary to permit the design process to be carried out in a correct manner, and to permit verification that the design meets applicable requirements. Design documents should be adequate to support design, construction, and operation.

2-1220 **Design Analysis.** Design analysis should be performed in a planned, controlled, and documented manner. Design analysis documents should be legible and in a form suitable for reproduction, filing, and retrieval. They should be sufficiently detailed as to purpose, method, assumptions, design input, references, and units such that a person technically qualified in the subject can review and understand the analyses and verify the adequacy of the results without recourse to the originator.

2-1230 **Design Verification,** Design control measures should be applied to verify the adequacy of design, such as by one or more of the following:

(a) Performance of design reviews: the following types of questions should be asked: Were the design inputs correctly selected? Are assumptions adequately described and reasonable? Was an appropriate design method used? Were design inputs correctly incorporated into the design? Is the design output reasonable compared to design inputs? Are the necessary design input verification requirements for interfacing organizations specified in design document, supporting procedures, or instructions?

(b) The use of alternate calculations: these are calculations or analyses that are made with alternate methods to verify correctness of the original calculations or analyses. The appropriateness of assumptions, input data used, and the computer program or other calculation methods used also should be reviewed.

(c) The performance of qualification tests: these tests should be clearly identified, defined, and documented. Testing should demonstrate adequacy of performance under conditions that simulate the most adverse design conditions. Test results should be documented and evaluated to assure requirements are met. If tests show changes are necessary to obtain acceptable performance, the modification should be documented and retested or otherwise verified. Such changes should be documented.

The responsible design organization, whether the contractor responsible for performing the QC and QA function or the Government activity responsible for performing the QA function, should identify and document the particular design verification methods to be used. The results of design verification should be clearly documented with the identification of the verifier clearly indicated. Design verification should be performed by a competent individual or group, other than those who performed the original design, including review by a safety and health professional. Verification should be performed prior to release for procurement, manufacture, construction, or release to another

organization. The design verification should be completed prior to relying upon the component, system, or structure to perform its function. Checklist for reviewing design documents are provided by Figures 4, 5, 6, and 7.

2-1240 **Change Control.** Changes to final designs, including field changes, should be justified and subjected to design control measures commensurate with those applied to the original design and approved by the same groups or organizations which reviewed and approved the original design documents. Where changes are made, design verification should be required for the changes, including evaluation of the effects of those changes on overall design.

A major field change is defined as a change which will adversely affect the quality of the data, will cause a significant change in the cost of the field effort, can be defined as a major change in the scope of the field effort, or will cause significant delays in the schedule.

A minor field change is defined as a change that would not adversely affect the quality of the data in the field or the rationale for the field procedures.

2-1250 **Interface Control,** Design interfaces should be identified and controlled and the design efforts should be coordinated among the participating organizations. Interface controls should include the assignment of responsibility and the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces. Design information transmitted between organizations should be documented and controlled. Verbal transmittal of information should be confirmed promptly by a controlled document.

2-1260 **Documentation and Records.** Design documentation and records should be collected, stored, and maintained in accordance with documented procedures. The documentation should include final design documents, such as drawings and specifications, and revisions to them, as well as documentation identifying the important steps, such as design inputs, that support the final design.

2-1300 **PERFORMANCE EVALUATIONS.** For the CLEAN program, monthly performance evaluations are required as a part of the procedures of verifying the contractor's invoice. Performance evaluations are also a part of the Award Fee Determination process. A third system, which also communicates the evaluation to other NAVFACENGCOM contracting officials, is the A-E Performance Evaluation, DD Form 1421 (New Designation DD 2631), which is accessible through the Office of the Corps of Engineers (OCE) A-E Contractor Appraisal Support System (ACASS). Refer to the NAVFACENGCOM CLEAN Contract Manual for further information regarding these contractor performance evaluation systems. For the various other hazardous waste control and minimization programs, the A-E contractor performance evaluation procedures promulgated by NAVFACENGCOM P-68, Part 36.604 applies.

FIGURE 4

Drawings Checklist

Project: _____ Date: _____

Drawing Numbers: _____ Project Review Deadline: _____

Project Manager: _____ QC Coordinator: _____ Initial: _____

Technical Reviewer: _____ Initial: _____

Respond 'YES, NO, or NA (Not applicable) to questions listed below:

_____ Is the scope of the set of drawings satisfactory?
_____ Is the function of the structures, equipment or component units shown satisfactory?
_____ Have the results of the latest design calculations been incorporated?
_____ Are interfaces with various discipline drawings correct?
_____ Have comments on previous check prints been incorporated?
_____ Has the designer signed the drawings?
_____ Does the design conform to all applicable codes, standards, etc.?
_____ Has accessibility for maintenance, repair and in-service inspection been provided?
_____ Is material selection proper?
_____ Are the items to be constructed as shown?
_____ Are dimensions and tolerances correct and consistent?
_____ Does drafting technique conform to the standards specified in General Drafting Standards?
_____ Are the drawings legible?
_____ Are the drawings reproducible?
_____ Have the technicians signed the drawings?
_____ Do the titles and drawing numbers agree with the cover sheet list of drawings?
_____ Have revisions been adequately identified?
_____ Have the reviewers signed and dated the "checked by" space of the title blocks?

Corrective Action Completed or Not Required _____
QC Coordinator Signature/Date

FIGURE 5

Specification Checklist

Project: _____ Project No: _____

Specification Numbers: _____ Review Deadline: _____

Project Manager: _____ QC Coordinator: _____ Initial: _____

Technical Reviewer: _____ Initial: _____

Respond YES, NO or NA (Not applicable) to questions listed below:

_____ Have the computer specifications been properly used in the preparation of the draft?
_____ Is specifications complete and clear to the extent necessary to properly specify design, construction and performance requirements?
_____ Are proper codes, standards, processes, etc., referenced?
_____ Are required tests and inspections specified?
_____ Is proper test and inspection documentation specified?
_____ Are construction and test requirements feasible?
_____ Is the acceptance criteria (tolerances, etc.) specified and are they adequate and realistic?
_____ Are provisions made for special construction procedures which may be necessary to keep the plant or facility in operation at all times during construction?
_____ Are measuring and test equipment calibration requirements and cleaning, storage, and handling requirements properly specified?

Remarks:

_____

_____

Attach sheets if additional space is required. Record number of sheets here: _____

Corrective Action Completed or Not Required _____
QC Coordinator Signature/Date

FIGURE 6

Manual Calculations Checklist

Page 1 of ___ Pages

Project: _____
Project Number: _____
Subject: _____
Computed By: _____ Date: _____ Review Deadline: _____
Project Manager: _____ QC Coordinator: _____ Initial: _____
Technical Reviewer: _____ Initial: _____

Level of Design Effort: Conceptual Preliminary

Purpose of Computations: _____
_____
Theories Used/References: _____
_____
Input Data Sources: _____
_____

Respond "YES, NO, or NA (Not Applicable) to questions listed below:

_____ Purpose of calculation clearly defined?
_____ Input data taken from reviewed and accepted calculations?
_____ Test data appropriately used in the calculations?
_____ Design criteria referenced?
_____ Assumptions clearly defined and applicable?
_____ Theories are applicable?
_____ Design methods used are consistent with accepted practice?
_____ Mathematics is correct and results are reasonable?
_____ Originator of calculations initialed and dated calculations?
_____ Reviewer initialed the calculations?
_____ Calculations are legible and in a form suitable for reproduction and filing?
_____ Copies of pertinent graphs or tables attached?
_____ All work intended to be covered by the calculations was performed?
_____ Calculations are included in project file?

Remarks: _____
_____
_____

Corrective Action Completed or Not Required _____
QC Coordinator Signature/Date

cc: Project Manager
Program QA Manager

FIGURE 7

Computer Calculation Checklist

Page 1 of ___ Pages

Project: _____
Project Number: _____
Subject: _____
Computed By: _____ Date: _____ Review Date: _____
Project Manager: _____ QC Coordinator: _____ Initial: _____
Technical Reviewer: _____ Initial: _____

Level of Design Effort: Conceptual Preliminary

Purpose of Computations: _____

Theories Used/References: _____

Input Data Sources: _____

Respond "YES, NO, or NA (Not Applicable) to questions listed below:

_____ The program was previously verified?
_____ Methods used are consistent with accepted practice?
_____ Theories used are applicable?

The input data were reviewed for the following:
_____ Latest issue of design criteria was used?
_____ Test data were a appropriately factored into the input data?
_____ Data from interfacing disciplines were appropriately factored into the input

_____ Assumptions are clearly defined and reasonable?
_____ Originator of input data initialed and dated the input sheets including revisions?
_____ Input data were taken from reviewed and accepted calculations?

The output data were reviewed for the following:
_____ Program was clearly identified on the output data?
_____ Purpose of calculation was clearly identified on the output data?
_____ Results are reasonable?
_____ Superseded or "void" output data are so identified?
_____ Calculations are listed in project index?

Remarks: _____

Corrective Action Completed or Not Required _____
QC Coordinator Signature/Date

cc: Project Manager
Program QA Manager

CHAPTER 3 REMEDIATION QUALITY PROCEDURES

3-100 **BACKGROUND.** The ultimate goal of the Installation Restoration, Underground Storage Tank and Asbestos Abatement programs is site restoration. In most cases, the various studies performed will lead to award of remediation contracts for the purpose of removal actions, remedial action, or abatement actions. These contracts are defined as contracts awarded to actually alter the site conditions via clean-up actions. These actions may include soil removal and disposal; soil remediation in-place; construction of fences, dikes or waste impoundments; removal of abandoned tanks; removal, encapsulation or enclosure of asbestos containing areas or implementing a long-term study.

The environmental contractor quality management program addressed herein is very similar to the one we have for conventional construction projects. The guidance concentrates on NAVFACENGCOM qualifications for the contractor QC organization personnel, QC plan, three-phases of control, submittal review and approval, testing, documentation, quality assurance and training. Deviations from our standard procedures for the administration of the construction QM program were made only to the extent necessary to implement the construction phase of remediation contracts.

NAVFACCO has awarded eight Remedial Action Contracts (RACs) for use nation wide to assist Engineering Field Divisions in cleaning up specific hazardous wastes. Specific information on Quality Management for RAC contracts should be discussed with NEESA who has been appointed as COTR for these contracts. A Navy Technical Representative (NTR) may be assigned to assist NEESA in the performance of its COTR functions. For EFD/EFA awarded RAC contracts, the PCO appoints the ACO and the COTR. The ACO appoints the NTR. The NTRs should be identified on individual delivery orders as required. The ROICC's role and responsibility whether functioning with appointed NTRs or in the traditional ROICC role are fundamentally the same and the duties are as discussed in this chapter.

3-200 **QUALITY MANAGEMENT.** The NAVFACENGCOM construction quality management program consists of quality control and quality assurance measures which apply to all construction contracts administered by NAVFACENGCOM. Quality control is a contractor function and quality assurance is a government function. These measures apply to remediation contracts as well. The quality management program consists of two primary elements:

1) Quality Control. Quality Control may be defined as the contractor's management of his own, his suppliers' and his subcontractors' activities to comply with contract requirements. Implementation of quality control is accomplished through two NAVFAC guide specifications (NFGS). NFGS-01400 is used primarily for large or complex projects and NFGS-SF-01400, a short form of NFGS 01400, is used primarily for small or routine projects.

2) Quality Assurance. Quality Assurance is the means by which the Government fulfills its responsibility in assuring that the QC Program is functioning and through reviews, surveillance and tests assures that the completed product complies with the contract. Quality assurance efforts will vary for each contract depending on the type of work, duration and complexity. For remediation contracts, certain regulations may require independent government verifications (or full time inspections), such as manifesting hazardous waste shipments. The utilization of PCAS or Title II contractor services may be required to assist the ROICC in the performance of Quality Assurance responsibilities. The foregoing is particularly true when the ROICC does not have in-house, or access to, the technical expertise to satisfactorily fulfill all the QA duties.

3-300 **QUALITY CONTROL REQUIREMENTS.** The Quality Control specifications NFGS 01400 and NFGS-SF-01400 should be used for all remediation contracts. Both guide specifications require tailoring by the ROICC and QA personnel of the EFD/EFA Construction and Environmental Divisions to ensure that the proper QC requirements are specified.

3-400 **QUALITY CONTROL PROGRAM REQUIREMENTS.** As detailed in NFGS-01400 and NFGS-SF-01400, the QC Program consists of a QC organization, a QC plan a coordination and mutual understanding meeting, QC meetings, three phases of control, submittal review and approval, testing, QC certifications and documentation.

3-500 **QUALITY CONTROL ORGANIZATION.** For a quality control program to be effective, there must be a planned program of actions with lines of authority and responsibilities clearly established. How the designated QC Manager will manage and control all construction operations should be analyzed, developed, and documented. The QC program is a valuable tool used to enforce the QC provisions of the contract. For large or complex projects, a separate QC organization is recommended. For the smaller less complex projects, the QC Manager may be allowed to perform production related duties. Requiring a separate QC organization, devoted to QC, provides the best opportunity to obtain the specified level of quality and build quality into the project.

When selecting the QC organization, QA personnel of the EFD/EFA Construction and Environmental Divisions should ensure that an appropriate QC organization is formed. The organization should be adequate staffed and have the requisite technical capabilities to accomplish all the quality control functions in a timely manner.

A typical QC organization for remediation contracts should consist of a QC Manager and QC Specialists. On smaller projects, QC personnel may have dual or multiple roles. The project specifications should clearly state the personnel required on site. When tailoring the specifications for remediation contracts, some of the options to consider are:

QC Manager duties

a. No work or testing may be performed unless the QC Manager is on the work site. The work site is defined as the location where the work is actually taken place. The requirement for the QC Manager to be on the work site should be limited to those issues or sites that require continued physical presence.

b. The QC Manager shall have [___] years working experience on similar size and type hazardous waste sites which included the remedial action or method being used as part of this contract.

c. The QC Manager shall report directly to an officer of the firm and shall not be the same individual as, nor be subordinate to, the job superintendent or project manager.

QC Manager qualifications

a. A graduate of a four year accredited college program [in Environmental, Civil, Chemical, or _____ Engineering] with a minimum of [___] years working experience as superintendent, inspector, QC Manager, project manager, or construction manager on similar size and type hazardous waste sites which included the remedial action or method being used as part of this contract. Equivalence of training experience should be given consideration when establishing a qualification for the QC Manager.

QC Specialists

a. Same qualifications as for construction contracts.

3-600 **HEALTH AND SAFETY** The contractor shall have an ongoing Health and Safety Program and prepare, implement, and enforce a site specific Health and Safety Plan in accordance with OSHA standards 29 CFR 1910.120 and 29 CFR 1926, U.S. Army Corps of Engineers EM 385-1-1, and any other federal, state and local regulations. Program and plan must be job specific and include work to be performed by subcontractors.

The site specific Health and Safety Plan should include the activity hazard analysis as required by EM 385-1-1 Appendix Y, paragraph b. The ROICC, Safety and QA personnel of the EFD/EFA Construction and Environmental Divisions must coordinate safety requirements with the QC Manager, QC specialists, the Certified Industrial Hygienist, the Site Health and Safety Officer, the Command Post Supervisor, Decontamination Officers and Rescue team for all remediation contracts. The ROICC is responsible for approving the Health and Safety Plan after consultation with the EFD/EFA Safety Manager and EFD/EFA technical representative prior to work start at each major phase. The EFD/EFA Safety Manager is responsible for reviewing the

Health and Safety Plan and providing recommendations to the ROICC. Figure 8 provides a sample checklist for evaluating these plans. Guidelines should be established to assure that all applicable comments are incorporated during the review process. For specific questions regarding health and safety, contact the EFD/EFA Safety Manager and technical representative.

3-700 **QUALITY CONTROL PLAN.** The contractor is required to provide a quality control plan. The plan must strongly emphasize that quality will be obtained through a preventive type of control of each definable feature of work. This requires an understanding of a definable feature, as discussed later on in this guide. This plan is to be approved by the ROICC after consultation with the QA personnel of the EFD/EFA Construction and Environmental Divisions and incorporation of all applicable comments.

The QC Plan should include the requirements detailed in the quality control specification and any other requirements necessary to comply with environmental laws and regulations. As required by NFGS 01400, the plan will cover both on-site and off-site work and include, the following:

a. A chart showing the QC organization.
b. Names and qualifications of the QC organization personnel.
c. Duties and responsibilities of each person in the QC organization.
d. A listing of outside organizations, such as consulting firms.
e. A letter signed by an officer of the firm appointing the QC Manager and stating his/her responsibility for managing and implementing the QC program. This letter must include the QC Manager's authority to direct the removal or re-work of non-conforming work.
f. Submittal procedures and Submittal Register.
g. Testing Laboratory information.
h. Testing Plan and Log.
i. Procedures to identify, record, track and complete re-work items.
j. Documentation procedures.
k. A list of definable features of work.
l. A personnel matrix.

3-800 **COORDINATION AND MUTUAL UNDERSTANDING MEETING.** This initial meeting will set the tone for creating a good working relationship with the contractor; its importance cannot be overemphasized. During this meeting, develop a mutual understanding with the contractor of the QC details, including documentation, administration of on-site and off-site work and coordination with the contractor's personnel including management, production, QC and health and safety personnel. The importance of establishing good communication from the start will go a long way towards achieving the required end product, which is a safe working environment and a clean site.

FIGURE 8

HEALTH AND SAFETY PLAN CHECKLIST

CONTRACT # _____ SITE/LOCATION _____

DATE REVIEWED _____ REVIEWED BY _____

AT A MINIMUM THE HASP SHOULD INCLUDE THE FOLLOWING INFORMATION:

ELEMENT	REQUIREMENT 1910.120 SECTION	ADEQUATE EM 385-1-1 APPENDIX Y	YES	NO
1. NAMES OF KEY PERSONNEL RESPONSIBLE FOR SITE SAFETY & ACCIDENT PREVENTION	(b) (2)	a.(1)	___	___
2. LOCAL REQUIREMENTS WHICH MUST BE COMPLIED WITH		a.(2)	___	___
3. SAFETY AND HEALTH RISK ANALYSIS FOR EACH SITE TASK AND OPERATION	(b) (4)		___	___
4. PROCEDURES FOR ACCIDENT INVESTIGATIONS		a.(10)	___	___
5. SITE CONTROL MEASURES (INCLUDING WORK OF SUBCONTRACTORS)	(d)	a.(3)	___	___
6. EMPLOYEE TRAINING ASSIGNMENTS	(e)	a.(5)	___	___
7. MEDICAL SURVEILLANCE REQUIREMENTS	(f)		___	___
8. PERSONAL PROTECTIVE EQUIPMENT FOR EACH OF THE SITE TASKS AND OPERATIONS	(g)		___	___
9. DETAILS OF FALL PROTECTIVE SYSTEM		a.(11)	___	___
10. FREQUENCY & TYPES OF INSPECTIONS, AIR & PERSONNEL MONITORING, ENVIRONMENTAL SAMPLING TECHNIQUES & INSTRUMENTATION ALONG WITH METHODS FOR MAINTENANCE & CALIBRATION OF EQUIPMENT	(h)	a.(9)	___	___
11. CONFINED SPACE ENTRY PROCEDURES	(j) (9)		___	___
12. SPILL CONTAINMENT PROGRAM	(j)		___	___
13. DECONTAMINATION PROCEDURES	(k)		___	___
14. EMERGENCY RESPONSE PLAN	(l)	a.(8)	___	___

3-900 **QC MEETINGS** The follow-up weekly meetings will be an extension of the initial coordination and mutual of understanding meeting. These meetings include review of specifications, review of schedule, review of submittals, testing required, and most importantly, work to be accomplished the following two weeks. These meetings provide a forum for discussing the three phases of control.

3-1000 **THREE PHASES OF CONTROL.** From years of experience, it has been found that certain QC procedures work well in facilitating quality construction. One of these procedures is the three phases of control concept, in which the contractor's control of quality is divided into three phases for each definable feature of work: preparatory phase, initial phase and follow-up phase. A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements. Each control phase provides the opportunity to prevent problems and deficiencies.

All NAVFACENGCOM construction contracts require the contractor to implement and maintain full responsibility for performance of the three phases of control. Through the three phases of control, the contractor is required to hold meetings to discuss, review, examine, resolve conflicts and verify that work is being performed in accordance with contract requirements. The ROICC should ensure that the QC procedures for each definable feature or work include all the environmental considerations with specific attention focused on the hazards involved, liabilities, testing labs, safety plan implementation (personal protective equipment, response teams), etc.

3-1100 **SUBMITTAL REVIEW AND APPROVAL.** NAVFACENGCOM guidance and procedures for review and approval of submittals are detailed in NFGS 01300, "Submittals". As detailed in this specification, the QC organization is responsible for reviewing and certifying that submittals are in compliance with the contract. Each submittal must be submitted in accordance with the contract and reviewed for completeness and accuracy to satisfy the intended use of the data.

The ROICC should coordinate with the QA personnel of the EFD/EFA Construction and Environmental Divisions to determine which submittals require QC Manager approval, government approval or approval by an outside agency. When using the Construction Criteria Base (CCB), a submittal register can be obtained from the A-E of record and should be generated prior to contract award.

When submittals are to be reviewed or approved by the QC Manager, it is important to place that responsibility on the QC Manager from the start. When spot checking reveals that submittals are not being properly reviewed or approved in accordance with the contract, an evaluation of the quality control program must be initiated and immediate corrective action should be taken. Some corrective action guidance for submittals which were improperly reviewed or approved by the QC Manager follows:

a. When a QC Manager is responsible for reviewing and approving submittals, the ROICC should check the initial submittals to confirm the adequacy of the review in order to preclude future rejection of non-complying work. However, most ROICCs are not staffed to perform this function throughout the contract and should, therefore, strongly encourage the contractor to thoroughly review all submittals so that non-complying submittals are disapproved prior to submission to the ROICC, rather than depend on the ROICC office to accomplish the detailed review. Only those submittals which comply with contract requirements are to be approved and forwarded to the ROICC.

b. The contractor needs to understand early on that contractor reviewed and approved submittals must be reviewed by the QC Manager prior to being accepted for record purposes. If they are not submitted in accordance with the contract, the QC Manager should reject them.

The ROICC should continue to spot check QC Manager review and approval of submittals until an improved acceptable level is reached or additional corrective action is taken. The contractor is required to maintain at the job site an up-to-date submittal register showing all submittals required by the contract.

3-1200 **TESTING.** NEESA is currently evaluating analytical testing laboratories for remediation contracts in the IR program. Each laboratory goes through an evaluation procedure to validate the accuracy of its work. This validation is coordinated centrally by NEESA. All laboratories conducting remediation testing must follow this procedure. The evaluation procedure can take approximately 3-4 months. Submit the name and submittal requirements of the construction contractor's proposed testing lab to the LEIC/COTR (or EIC/NTR) for coordination with NEESA. The evaluation of the testing laboratory will require 3 to 4 months. This must be taken into consideration when deciding schedules. For remediation contracts that require laboratory evaluation or approval and are not in the IR program, contact the LEIC/COTR (or EIC/NTR) for assistance.

3-1300 **DOCUMENTATION.** The new reporting formats implemented by NAVFACENGCOM letter 022A/REPORTS.WP of 10 Sep 91 can be used for remediation contracts. The forms are:

Contractor Production Report
Contractor Quality Control Report
Contractor Quality Control Report Continuation Sheet (front and back)
Rework Items List
Testing Plan and Log

These forms are acceptable for providing the information required in remediation contracts. While use of these specific forms is not required, any other format shall contain the same information.

3-1400 **QUALITY ASSURANCE.** Every ROICC should initiate the QA process by first providing input for specifying the proper quality control requirements in the construction contract during the constructibility review process. The ROICC and the QA personnel of the EFD/EFA Construction and Environmental Divisions must coordinate and establish guidelines to incorporate the required QC requirements during the design stage. The ROICC should conduct constructibility reviews at the 35% and 100% stages.

As outlined in NAVFACENGCOM P-445, Construction Contract Quality Management Manual, every ROICC, with the assistance of the A/E, the QA personnel of the EFD/EFA Construction and Environmental Divisions should consider developing a concise quality assurance plan for each construction project. The plan should focus on enforcing the quality control provisions of the contract. When developing a plan for remediation contracts, you should consider those same requirements as well as any other requirements to meet environmental laws and regulations, such as any requirements that may require full-time inspection by the government, QA training for personnel performing hazardous waste operations, etc. An example of areas to consider in preparing a quality assurance plan is shown in appendix K of P-445.

The ROICC should devote most of the QA effort to assure that the contractor provides and fully implements a good quality control plan. A good QC Manager with the proper qualifications and authority that follows the QC plan to the letter can make the QC program effective. The construction contractor, and not the ROICC is solely responsible for implementing the quality control plan. A very important part of this plan is the performance of the three phases of control concept which focuses on problem avoidance versus problem catching. The three phases, consisting of preparatory, initial and follow-up meetings can alert the contractor to potential problems and how to plan accordingly to avoid them.

To assure that the QC program gets off to a good start, the ROICC should be prepared to attend the first few three phases of control meetings, all the critical three phases of control meetings and as many three phases of control meetings as needed to assure that they are being performed satisfactory and are properly documented. The following personnel should attend and participate in the preparatory and initial phase meetings:

ROICC personnel
QC Manager/QC Specialists
Superintendent
Foreman responsible for the definable feature of work
Safety personnel
Certified Industrial Hygienist

During site visits, the ROICC should focus on the process by which the quality control program is being implemented and not rely on inspection alone. If site visits reveal that deficiencies are occurring, the ROICC should concentrate his efforts on correcting the process that led to the deficiencies. A careful review of the documentation of the three phase meetings that have been held should be conducted to help determine the cause of the problem. Following the results of the preliminary review, the ROICC should be prepared to attend as many future three phase meetings as necessary to assure that they are being properly conducted. If the QC procedures are deficient, corrective action should be taken immediately. Emphasis on correcting contractor deficiencies needs to be done from the onset. Remember, problem avoidance starts before actual work starts, once you start work and deficiencies occur, you are problem catching. All corrective action taken by the ROICC should be properly documented.

The ROICC should become familiar with the Record of Decision (ROD) or Action Memorandum for Removal Actions which describe the specific details and procedures for cleaning up a site, and the regulations that control how clean a site must be at the conclusion of the project. Remediation contracts require the ROICC to be extra sensitive towards any changes to the design, process or procedures, including field changes. All such changes should be coordinated with the EIC. Adequate control must be established to assure that all the environmental laws and regulations are followed. The ROICC should be aware that any changes to these documents may involve legal liabilities to the person authorizing the change.

3-1500 **MINIMUM SAFETY AND HEALTH TRAINING FOR PERSONNEL PERFORMING HAZARDOUS WASTE OPERATIONS AND REMEDIATION PROJECTS**

1. These courses are mandatory for personnel involved in Hazardous Waste Operations (HWO) and remediation projects. No one is allowed to perform site work prior to receiving this required training. Safety and Health training requirements are mandated by Congress in the Superfund Amendment and Reauthorization Act of 1986. Under the authority of SARA, the Occupational Safety and Health Administration (OSHA) expanded its regulations to cover HWO (29 CFR 1910.120). Based on projected workload for environmental projects, each ROICC office shall ensure that an adequate number of Construction Representatives and Engineering Technicians and their on-site supervisors receive the following training. If you have questions as to who should be trained, contact your EFD Safety and Health Manager for assistance. Personnel training shall be monitored throughout each environmental contract to assure that each employee receives and maintains the appropriate level of training required by 29 CFR 1910.120(e).

a. Safety/Health for HWO (40 hours for Construction Representatives and Engineering Technicians, 40 hrs or their supervisors plus an additional 8 hours of supervisory training) (see notes 1 & 2 & 5 & 6)

b. Annual refresher (8 hours) (see notes 1 & 2 & 5 & 6)

c. Supervised on-the-job training (see note 3 & 6)

d. Specialized training necessary to perform tasks (i. e. asbestos, beryllium, lead, solid waste, underground storage tanks, respiratory protection, state regulated training, etc.) (see notes 4 & 5 & 6)

NOTES: (1) The Naval Energy and Environmental Support Activity (NEESA) offers this course at various activities throughout the year. For details and course arrangements please contact NEESA Code 112E4, Commercial (805) 982-4853 or DSN 551-4853.

(2) US Army Proponent Sponsored Engineer Corps Training (Prospect) course.

(3) Each EFD Safety and Environmental office shall develop a 3 day on-the-job training (supervised) and any other special training needed to perform HWO and remediation projects.

(4) ROICC personnel involved in asbestos projects shall receive training and accreditation in accordance with federal, state and local laws governing asbestos operations. Additional hazard specific safety and health training shall be provided prior to personnel exposure on-site.

(5) Alternate sources of HWO training are available. Contact your EFD Safety and Environmental office for course schedules and additional information.

(6) The EFD Safety Manager shall assist ROICC personnel to ensure that appropriate training is provided.

3-1600 **PERFORMANCE EVALUATION.** Prepare and distribute construction contractor's performance evaluations using Standard Form 1420 in accordance with NAVFACENGCOM P-68, para. 36.201 for each construction contract or individual delivery order.

APPENDIX A

GLOSSARY

ACTIVITY - A Department of Defense organizational unit. In Navy use, this term corresponds with the specific location of a naval shore command or one of its branches. Regulatory guidance documents use "activity" to denote different actions taken during the compliance process.

ACTIVITY HAZARD ANALYSIS - Part of a Health and Safety Plan developed by the contractor identifying the sequence of work, the specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard.

ACCURACY - Degree of agreement of a measured value with the true or expected value of the quantity of concern. Accuracy measures the bias in a measurement system. Sampling accuracy may be assessed by evaluating the results of field trip blanks, analytical accuracy may be assessed through use of known and unknown QC samples and matrix spikes.

ARARs - Applicable or Relevant and Appropriate Requirements; the minimum degree of cleanup for site remedial actions according to Federal and promulgated state laws. Applicable requirements relate directly to the circumstances of release; relevant and appropriate requirements are similar and well suited to the circumstances.

AUDIT - A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: (1) performance audits in which Quantitative or Qualitative data are independently obtained for comparison with routinely obtained data in a measurement system or (2) systems audits of a qualitative nature that consist of an on-site review of a laboratory's quality assurance system and physical facilities for sampling, calibration, and measurement.

BIAS - A systematic displacement of all the observations in a sample from the true or value, or a systematic and consistent error in test results.

CERCLA - Comprehensive Environmental Response and Liability Act of 1980.

CRP - Community Relations Plan: An installation-specific plan to inform and involve the public in the Navy's Installation Restoration process and respond to community concerns.

CONTRACTOR - The prime contractor source for services described in this work statement.

COTR - contracting Officers Technical representative; the government person who is responsible for technical administration and oversight of a contract.

CONTRACT REQUIREMENTS DOCUMENTS - used to mean all work statements, specifications, standards, guides, handbooks, standard operating procedures, standard test methods, designs, data item descriptions, and other documentation used to define contract requirements or measure contractor performance and the quality of services and deliverables.

CHAIN-OF-CUSTODY - Documentation that describes the physical control of a sample, measurement, or document.

COMPARABILITY - A qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability Is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results In appropriate units.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.

COMPOSITE SAMPLE - A sample representing the mixing of two or more grab samples from which a single aliquot is taken to represent an average value.

DATA QUALITY - The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability.

DATA QUALITY OBJECTIVES - 1) Site-specific data collection objectives logically and consistently analyzed to support design of a data collection project. “Statements that specify the data needed to support decisions regarding remedial response activities” (EPA/540/G-89/004). 2) Qualitative and quantitative statements specified to ensure that data of known and appropriate quality are obtained to support specific decisions or regulatory actions.

DATA VALIDATION - A systematic effort to review data to identify any outliers or errors and thereby cause deletion or flagging of suspect values to assure the validity of the data to the user. This “screening” process may be done by manual and/or computer methods and it may utilize any consistent techniques such as sample limits to screen out impossible values or complicated acceptable relationships of the data with other data.

DEFENSIBLE - well documented, clear, unambiguous, and understandable with respect to the applicable laws. In environmental data acquisition and interpretation, defensibility

implies public, regulatory, and judicial scrutiny for correct application of experimental designs, technical methods and procedures, error analyses and confidence quantification, and interpretive models.

DEFENSIBILITY - Ability to defend, through documented objective evidence, the origin, chain of-custody, matrix of scientifically acceptable operations performed, reduction, and transcription of data, so that their limitations, representativeness and applicability are known.

DPM - Defense Priority Model: a computer-based ranking model that utilizes site-specific monitoring data to assign individual site scores to prioritize defense environmental funding (see flRS*).

ENVIRONMENTALLY-RELATED MEASUREMENTS - A term used to describe essentially all field and laboratory investigations that generate data involving the measurement of chemical, physical, or biological parameters in the environment; determining the presence or absence of priority pollutants in waste streams; health and ecological effect studies; clinical epidemiological investigations; engineering and process evaluations; studies involving laboratory simulation of environmental events; and studies or measurements on pollutant transport, Including diffusion models.

FIELD BLANK - A sample which is obtained by running analyte-free deionized water through sample collection equipment after decontamination, and placing it in the appropriate sample containers for analysis. Field blanks are used to determine if decontamination procedures have been sufficient.

FIELD DUPLICATES - Independent samples collected in such a manner that they are collocated samples equally representative of the sample matrix at a given point in space and time.

FIELD QA (FOR CLEAN CONTRACTS)- QA applied to all aspects of field data collection; includes planning (DQOs), execution, interpretation, and reporting for SI and RI/FS work. Field QA and laboratory QA are inseparable concepts in total data error analysis.

FSP - Field Sampling Plan: a plan essential to Field QA resulting from the DQO process. With the Navy Laboratory QA Plan (or EPA QAPP), the FSP is an integral part of the Sampling and Analysis Plan (SAP).

GRAB SAMPLE - A discrete aliquot which is representative of a specific location at a specific point in time.

HRS - Hazard Ranking System: a uniform method of scoring and ranking potential risk (see Risk Assessment) at a suspect hazardous waste sites; used during the PA or SI phase only to determine National Priorities List (NPL) status.

HEALTH AND SAFETY PLAN - Detailed plan developed by the contractor which addresses the safety and health hazards of each phase of a site operation and includes the requirements and prodecures for employee protection. Required by OSHA 1910.120.

IAS - Initial Assessment Study: the pre-1987 name for Navy IRP work similar in scope to a PA/SI*. The IAS included on site inspections (some grab sampling) and detailed background work that meets many of EPA site history, physical/ biological setting, and conceptual site model requirements for RI/FS scoping.
IRP - Installation Restoration Program: 1) The Department of Defense program for response to CERCLA/SARA regulation. 2) The DOD program name for actions taken to comply with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986. The IRP is the major Navy program for identification and cleanup of hazardous waste sites.

LABORATORY QUALITY ASSURANCE PLAN - Navy functional equivalent of the EPA “Quality Assurance Project Plan” (QAPP); a deliverable (currently separate from the SAP) under the Navy IRP Laboratory QA Program (NEESA 20.2-047B).

LABORATORY (REAGENT) BLANK - A sample which is prepared and analyzed by the laboratory, prior to during analysis of each sample batch, to demonstrate that identified compound concentrations do not reflect laboratory contamination.

LABORATORY DUPLICATES - Two aliquots taken in the laboratory from the same sample container with one of the aliquots identified as the duplicate and the other aliquot original sample. Each aliquot is treated identically through the laboratory analytical procedure.

LINE-PROCESS - an adjective used to describe environmental work performed directly for the purpose of attaining environmental data, designs, and facilities for environmental cleanup and compliance; includes the manufacture or supply of routine services, materials, and equipment for hazardous waste site investigation or remediation. By this definition, line-process contractors cannot perform QA work for the government because it would constitute a direct conflict of interest.

MATRIX SPIKE SAMPLE - An aliquot of sample to which has been added a known quantity of one or more of the target analyses.

NAVY TECHNICAL REPRESENTATIVE - Appointed by the Contracting Officer, for the requiring activity, to assist the COTR in executing inspection and monitoring duties.

PA - PRELIMINARY ASSESSMENT. In EPA SARA use, an abbreviated environmental property survey designed to locate sites of suspect contamination, usually without on-site inspection. In the Navy IRP, a PA always includes actual site visit and inspection and more detailed physical/biological assessment.

PRECISION - A quantitative measure of the variability of a group of measurements compared to their average value. Precision measures the reproducibility of measurements under a given set of conditions and is generally stated in terms of the standard deviation.

PERFORMANCE AUDIT - Planned Independent check of the operation of a measurement system to obtain a quantitative measure of the quality of the data generated. This involves the use of standard reference samples or materials which are certified as to their chemical composition or physical characteristics.

PE SAMPLE - performance evaluation sample; a special test sample provided by the QA/QC Contractor as a blind control sample for any analysis method to a contract laboratory as a measure of that laboratory's ability to perform that analysis method.

PROJECT OFFICER - A prime contractor project manager, whose duties include final Quality Control (QC) supervision of data collection, interpretation, and reporting aspects of a site data collection project.

PROPERTY - The contiguous land within a real estate boundary other Navy-owned or under Navy cognizance. The land out side such a boundary is referred to as off-property. Regulatory documentation often uses the word "site" to indicate an entire property.

QAMS - EPA Quality Assurance Management Staff.

QAPP - QUALITY ASSURANCE PROJECT PLAN (also denoted in EPA/540/G-87/003 as QAPP): "A plan that describes protocols necessary to achieve the DQOs defined for an SI or RI (EPA/540/G-89/004). However, QAPPs are virtually the same in scope as Navy IRP Laboratory QA Plans and do not meet the scope of DQOs.

OSWER - EPA Office of Solid Waste and Emergency Response.

QUALITY - A measure of the value of a product, often subjective and relative. In material procurement, however, product quality is measured against specifications for physical tolerances and performance limits. In information procurement, quality is measured against acceptance criteria and quantitative specifications for data error and statistical confidences.

QUALITY ASSURANCE (FOR CLEAN CONTRACTS)- (1) The total integrated program for assuring the reliability of monitoring and measurement data. (2) A system for integrating the quality planning, quality assessment and quality improvement efforts of various groups in an organization to enable operations to meet user requirements at an economical level. In pollution measurement systems, quality assurance is concerned with all of the activities that have an important effect on the quality of the pollution measurements, as well as the establishment of methods and techniques to measure the quality of the pollution measurements. The more authoritative usages differentiate between "quality assurance: and quality control, where quality control is the system of activities to provide, a "quality product" and quality assurance is the System of activities to provide assurance that the quality control system is performing adequately".

QUALITY CONTROL MANAGEMENT PLAN (FOR CLEAN CONTRACTS)- An orderly assembly of management policies, objectives, principles and general procedures by which an organization outlines how it intends to produce quality data.

QUALITY ASSURANCE PROJECT PLAN (FOR CLEAN CONTRACTS)- An orderly assembly of detailed and specific procedures by which an organization delineates how it produces quality data for a specific project or measurement method.

QUALITY CONTROL SAMPLES - A planned check of the operation of a measurement system to obtain a measure of the quality of the data generated. Examples of QC sample types are:

- Blank Samples
- Duplicate Samples
- Split (Replicate) Samples
- Matrix Spike Samples

QUALITY CONTROL - The overall system of activities or checks whose purpose is to control the quality of a product or service so that it meets the specified needs of the user.

QUALITY ASSURANCE: in procurements the end-responsibility of the government; the Federal Acquisition Regulation (FAR, part 46) QA focus is for inspection/acceptance of contract products by the government. QA is intimately dependent upon work statements, standards, and specifications as the end criteria for inspection/acceptance of products. QA is a process in which the quality of a product is planned and specified to the extent that Quality Control (QC) procedures can be developed to measure and control error.

QUALITY CONTROL - Procedures, often statistical, developed and implemented to measure and control or correct product quality or error to meet QA specifications or standards. Responsibility of the contractor in procured services.

QUALITY CONTROL SUPERVISOR - The contractor representative who has comprehensive project technical ability, professional certification, and signature authority for all field documentation; and who provides oversight responsibilities in execution of field data collection, interpretation, and reporting.

QUALITY MANAGEMENT - The combining and performing of QA and QC functions is referred to as Quality Management, i.e. QC + QA = QM.

REMOVAL ACTION - A short-term action taken in response to the release of hazardous substances that may present an imminent or substantial danger to human health or the environment.

RI/FS - REMEDIAL INVESTIGATION/FEASIBILITY STUDY: an integrated, iterative process in which information from successive environmental data tests is used to determine defensible solutions to a CERCLA contamination site by adhering to constraints dictated by Risk Assessment; current remedial response technologies; regulatory requirements (ARARs); and cost.

RISK ASSESSMENT - An evaluation of the present and future net hazard posed to any biological population from a hazardous waste site.

RPM - in Navy use, REMEDIAL PROJECT MANAGER; a technical representative of the Navy who administers or assists a COTR in administration of an IRA contract.

REPRESENTATIVENESS - Assurance that presented data are statistically sound and accurately show the physical or chemical state of the parameters tested/measured at a given time and place.

RINSATE BLANK - A field blank prepared for soil sampling activities by running analyte-free deionized water through sample collection equipment after decontamination, and placing it in the appropriate sample containers for analysis. Rinsate blanks are used to determine if soil/sediment sampling decontamination procedures have been sufficient.

SOFTWARE - Software refers to any computing systems language data, or programming package, component, or macro/subroutine needed for data processing. Software is often written by individuals using computers and in no way implies the existence of a commercially-available product.

SAP - SAMPLING AND ANALYSIS PLAN: Consists of a Laboratory Quality Assurance Plan (or EPA “QAPP”) and a Field Sampling Plan (FSP). Navy SAP calls for

distinction between a generic standard procedures and protocols; and a set of site-specific plans.

SARA - Superfund Amendments and Reauthorization Act of 1986.

SCOPING - A site-specific, QA-critical planning process including development of DQOs based on existing data review, conceptual site modeling, site boundary definition, preliminary identification of ARARs*, and initial remedial response actions.

SITE INSPECTION - A process that follows the PA* and precedes the RI/FS. Sites are visited, inspected, and sampled to determine the need for further work. In Navy IRP, PA and SI are often accomplished at one time.
Site- The inclusive area in the environment of specific past materials release or disposal. Documented Navy IRP sites include inert material disposal areas in addition to areas where the presence of hazardous materials is either known or suspect. Often several Navy IRP sites exist on one property. This term has no exact equivalent in EPA terminology, but is similar to “operable unit”.

SITE-SPECIFIC - Pertaining only to the site in question; not standard or generic in nature.

SITE-SPECIFIC QUALITY CONTROL - Any site condition or Data Quality Objective (DQO) requiring modification or addition to a standard procedure.

SPLIT (REPLICATE) SAMPLES - Two or more portions of a single sample that have been homogenized and split equally during sample gathering activities and submitted to the analytical laboratories as separate samples. The two sample portions must be identical.

STANDARD OPERATING PROCEDURES - A written, sufficiently detailed set of instructions that facilitates the reproducible and/or cost-effective implementation of each of the elements of work plan, QC, QCM, administration, or procurement. Such SOPs are the translation of policy into operation.

TRIP BLANK - A sample which is prepared by the laboratory prior to the sampling event In the actual sample containers and is kept with the investigative samples throughout the sampling event. Trip blanks are packaged for shipment with the other field samples and sent for analysis to detect for possible contamination associated with sample handling. Trip blanks generally pertain to volatile organic samples only.

WORK PLAN - The overall plan, or logically subdivided series of plans, for an RI/FS project in compliance with SARA: includes Sampling and Analysis Plan (SAP), Health and Safety Plan (HSP), and Community Relations Plan (CRP). Work Plans for SI do not require a CRP.

APPENDIX B

ABBREVIATIONS

ACASS	A-E Contractor Appraisal Support System
ACO	Administrative Contracting officer
ASBCA	Armed Services Board of Contract Appeals
CAA	Clean Air Act
CACO	Corporate Administrative Contracting officer
CAO	Contract Administration office
CAS	Cost Accounting System
CBD	Commerce Business Daily
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CO	Contracting Officer
COR	Contracting officer's Representative
CORA	Cost of Remedial Action (model, EPA)
COTR	Contracting officer's Technical Representative
CPAF	Cost Plus Award Fee
CPSR	Contractor Purchasing System Review
CQAPP	Construction Quality Assurance Project Plan
CTO	Contract Task Order
CWA	Clean Water Act
DAR	Defense Acquisition Regulation
DBA	Davis-Bacon Act
DCAA	Defense Contract Audit Agency
DCMC	Defense Contract Management Command
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DFARS	Defense Federal Acquisition Regulation Supplement
DLAM	Defense Logistics Agency Manual
DIPEC	Defense Industrial Plant Equipment Center
DoD	Department of Defense
DQO	Data Quality Objectives
EC	Environmental Coordinator
EFD	Engineering Field Division
EIC	Engineer-in-Charge
EPA	Environmental Protection Agency
FAR	Federal Acquisition Regulation
FDO	Fee Determination Official
FFP	Firm Fixed Price
G&A	General and Administrative
GE	Government Estimate

APPENDIX B

ABBREVIATIONS (continued)

HM	Hazardous Material
HW	Hazardous waste
IQ	Indefinite Quantity
IR	Installation Restoration
JLC	Joint Logistics Command
JTR	Joint Travel Regulations
LEIC	Lead Engineer-in-Charge
MIS	Management Information System
NAVFACENGCOM	Naval Facilities Engineering Command
NAVFACCO	Naval Facilities Contracting office, Port Hueneme
NAVSUPSYSCOM	Naval Supply Systems Command
NCP	National Contingency Plan
NFCTC	Naval Facilities Contracts Training Center
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NTE	Not to Exceed
NTR	Navy Technical Representative
OA	Obligation Authority
OICC	Officer In Charge of Construction
OPNAVINST	Chief of Naval operations Instruction
PA	Pollution Abatement
PA	Property Administrator
PA/SI	Preliminary Assessment/Site Inspection
PCO	Procurement Contracting Officer
PCR	Pollution Control Report
PEB	Performance Evaluation Board
PMO	Project Management Office
PWO	Public Works Officer
QA	Quality Assurance
QAMP	Quality Assurance Management Plan
QAPP	Quality Assurance Project Plan
QCMP	Quality Control Management Plan
QC	Quality Control
RA	Remedial Action
RAC	Remedial Action Contractor
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
ROD	Record of Decision

APPENDIX B

ABBREVIATIONS (continued)

ROICC	Resident Officer in Charge of Construction
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SCA	Service Contract Act, or Supporting Contract Administration
SECNAV	Secretary of the Navy
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SOW	Statement of Work
TEB	Technical Evaluation Board
UIC	Uniform Identification Code

APPENDIX C

BIBLIOGRAPHY

1. EPA QAMS-004/80 — Guidelines and Specifications for Preparing Quality Assurance Program Plans September 20, 1980

2. EPA QAMS-005/80 — Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, December 29, 1980 (Clarified and can be replaced by EFP, 1984)

3. EPA OWRSQA-1 — "Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring". 1984

4. QAMS — "Development of Data Quality Objectives - Description of Stages I and II" July 16, 1986

5. EPA-540/G-87/003;003A — Data Quality Objectives for Remedial Response Activities. Volumes 1 and 2 March, 1987

6. EPA/540/G-89/004 — "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA: Interim Final. OSWER Directive 9355.3-01. October 1988a

7. EPA — RI-FS Improvements Follow-up, Office of Emergency and Remedial Response, OSWER Directive 9355.3-05, 25 April 1988b

8. EPA — Contract Laboratory Program Statement of Work for Organics Analyses. February, 1988

NOTE:
Quality Assurance Management Staff (QAMS)
Office of Water Regulations and Standards (OWRS)

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BIBLIOGRAPHY (Continued)

9. EPA — Contract Laboratory Program Statement of Work for Inorganics Analyses. July, 1988

10. EPA-Data Review Work Group — Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses. February 1, 1988

11. EPA-Data Review Work Group — Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses. July 1, 1988

12. EPA/OERR — User's Guide to the Contract Laboratory Program. December, 1988

13. EPA-600/9-76-005 — Quality Assurance Handbook for Air Pollution Measurement Systems. Volume I. March, 1976

14. EPA — User's Guide to the Contract Laboratory Program. December, 1988

15. Clesceri, L.S. — Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington DC., 17th edition, 1989

16. U.S. EPA, SW-846 — Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Volumes 1 and 2, 1986

17. NEESA 20.2-047B — Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. June, 1988.

APPENDIX C

BIBLIOGRAPHY (Continued)

18. NEESA 20.2-057 Installation Restoration Program Quality Assurance Guide (Draft-Feb)

NOTE:
The documents listed above or their most current revision will be in effect during the revision of the plan.

APPENDIX D

QUALITY ASSURANCE PROJECT PLANS

This appendix provides additional information about QAPPs. As discussed in paragraph 2-200, a QAPP should be written for each project or group of related projects. As an example of what a QAPP should include, the following information is from EPA guidance, especially Region X. Refer to the particular EPA region of concern for specific guidance.

The format for a QAPP as described in EPA OAMS-005/80, ***Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,*** December 29, 1980, is as follows:

(a) Title page with provision for approval signatures.

(b) Table of contents.

(c) Project description.

(d) Project organization and responsibilities.

(e) Quality assurance objectives for measurement data in terms of precision, accuracy, completeness, representativeness, and comparability.

(f) Sampling procedures.

(g) Sample custody and documentation.

(h) Calibration procedures and frequency.

(i) Analytical procedures.

(j) Data reduction, validation, ad reporting.

(k) Internal quality control checks and frequency.

(1) Performance and system audits and frequency.

(m) Preventive maintenance procedures and schedules.

(n) Specific routine procedures to assess data precision, accuracy, completeness, representativeness, and comparability.

(o) Corrective action.

(p) Quality assurance reports to management.

In an instance where specific quality assurance targets or procedures are addressed as an integral part of a project Work Plan, or Sampling Plan, it will not be necessary to rewrite them in the QAPP. These other documents may be referenced by citing the document and the page numbers on which the quality assurance material appears in that document. This citation shall be placed in the appropriate subsection of the QAPP.

The following subsections provide guidance pertinent to each of the sixteen elements which shall be addressed.

(1) Title Page. The title page shall list the contract number, project title, EPA's Region, the Deputy Program Manager, and the QA Manager. A place shall be provided for approval signatures by the Deputy Program Manager, QA Manager, Site Manager, and the EPA Project Officer and QA Officer.

(2) Table of Contents. The table of contents shall include all elements of the QAPP, all reference materials and appendices, and a distribution list. An introduction to the plan should be written and placed on the page following the table of contents.

(3) Project Description. This section shall provide a general description of the work assignment. This description may be brief, but shall have sufficient detail to allow for proper review and approval of the QAPP. The following format is suggested:

- Objectives and approach - specific project objective and approach is summarized.
- Site background - location (including site map), environmental setting; site operations, and preview sampling results are summarized.
- Rationale for selected approach - analytical parameters, methods, and detection limits/total number of samples/sample locations (with map), Quality Assurance/Quality Control samples, split samples, etc.
- Anticipated project schedule - dates anticipated for work assignment start, completion, and deliverables.

All or most of this information can be obtained from the applicable Work Plan or Sampling Plan and shall be incorporated by reference.

(4) Project Organization and Responsibility. A table or chart shall show the project organization and line authority. Key individuals shall be listed, including those team members who are responsible for ensuring the collection of valid measurement data and the routine assessment of measurement procedures for precision and accuracy. Descriptions of typical key individuals and their responsibilities are as follows:

- **0** Deputy Program Manager
  Overall responsibility for all phases of project execution

- **0** Site Manager
  Responsible for ensuring that appropriate methods and procedures are used in sample collection and control; responsible for ensuring the collection of valid measurement data

- **0** QA Team Leader
  Responsible for ensuring, through audits, projects adherence to QAPP

- **0** Peer Reviewers
  Responsible for providing timely, comprehensive review of project deliverables.

(5) Quality Assurance Targets for Measurement Data. The quality assurance targets for precision and accuracy of sampling and laboratory testing programs for each measurement parameter shall be stated. When establishing targets, it should be kept in mind that all measurements shall be made so that results are representative of the media (air, water, solids) and specific site conditions. Unless otherwise specified, all data shall be calculated and reported in generally accepted units. This practice allows for comparison among data bases.

Data Quality Objectives (DQOs) are quantitative and qualitative statements describing the quality of data needed to support a specific environmental decision or to determine whether data are appropriate for a particular application. Because higher level decision makers may have many other controlling or modifying considerations to interrelate, they must be involved “up front” in the development of DQOs, and be committed to a reiterative process with the decision makers and technical staff below them in the hierarchy. Some of the basic questions that need to be asked are: “Why do we want to do this project? What information is needed? What is the use of the data? What resources are available?

In general, the objectives for accuracy and precision are as follows:

- **0** Accuracy

  Establish level of confidence for each constituent to be measured (usually 90 percent is adequate).
  Determine the specific splitting and spiking strategy, using any available presampling knowledge of pollutant concentrations at the site and considering time and budget constraints.

- **0** Precision

  Decide whether a 0.25 standard error in the standard deviations is acceptable and, if not, re-estimate the number of sample splits and paired samples that are needed.

  For purposes of economy, try to coordinate sampling for precision determination with sampling for accuracy determination.

Also, to ensure the quality of data from field sampling, a certain number of blanks shall be submitted to the contract laboratory from each sampling campaign to demonstrate that any pollutants detected in the field samples are not the result of sample container contamination. Blank samples can consist of reagent grade (uncontaminated) diatomaceous earth, bentonite, or vermiculite for soil and sediment sample sets, or of ultrapure water for aqueous sample sets. If these substances are unattainable, it might suffice to submit empty sample containers that the analytical laboratory can rinse with ultrapure water to simulate blank samples. The type and numbers of blank samples shall be specified in the QAPP based on the work assignment objectives and quality level.

(6) Sampling Procedures. The objective of sampling procedures is to obtain samples that represent the environment being investigated. Trace levels of contaminants from external sources shall be eliminated through the use of good sampling techniques and proper selection of sampling equipment. When sampling of air, water, biota, sediments, soils, or wastes is required, a detailed field sampling plan shall be developed. The QAPP shall contain a description of the sampling procedures to be used. When applicable, the following shall be included:

- **0** Techniques or guidelines used to select sampling sites.

- **0** Specific sampling procedures to be used (by reference in the case of standard operating procedures and by actual description of the entire procedure in the case of nonstandard procedures).

- **0** Charts, flow diagrams, or tables delineating sampling program operations.

- **0** Containers, procedures, and reagents used for sample collection, preservation, transport, and storage.

- **0** Special preparation of sampling equipment and containers to avoid sample contamination (such as solvent rinsing of containers for organics or acid rinsing of containers for trace metals).

- **0** Blank samples, spiked, splits and other quality control samples as may be required by the governing guideline.

(7) Sample Custody. URS shall be able to prove that any analytical data presented to EPA accurately represents environmental conditions existing at the time of sample collection. It shall be clearly demonstrated that none of the involved samples could possibly have been tampered with during collection, transfer, storage, or analysis. Therefore, strict chain-of-custody shall be followed to trace the possession of each sample from the moment of its collection through its introduction into evidence. A sample is considered in custody if any one of the following requirements is met:

- **0** It is in the actual physical possession of the sampler or laboratory analyst.

- **0** It is in view of the sampler or laboratory analyst.

- **0** It was in the physical possession of the sampler or laboratory analyst and collected so no one could tamper with it.

- **0** The sample is kept in a secured area which is restricted to authorized personnel only.

- **0** The sample is placed in a container and then sealed with a “custody” seal that shall be broken when the container is opened.

This section shall include descriptions of procedures, forms, and methods to be used for recording sample history, sampling conditions, analyses to be performed, sample tracking, and sample custody.

(8) Calibration Procedures and Frequency. This section shall include the following information.

- **0** For each piece of equipment used, a reference to the applicable SOP or a written description of the calibration procedure(s) to be used.

- **0** Planned recalibration frequency.

- **0** Calibration standards to be used and their source(s).

- **0** Recording procedures.

For measurements conducted by URS Team staff, SOPs covering calibration shall be provided. The procedures specified are consistent with EPA procedures.

(9) Analytical Procedures. Standard analytical procedures (CLP methods) have been established by the EPA. These procedures shall be used to the extent possible and referenced in QAPP. Special analytical procedures required for special tests or lower detection levels of specific contaminants shall be described in the QAPP or Field Sampling Plan.

(10) Data Reduction. Validation. and Reporting. In this section, the following shall be described:

- **0** Planned reduction scheme for test results of collected samples.

- **0** Principal criteria that will be used to validate data integrity during data collection and reporting.

- **0** Methods used to identify and treat outliers (discarded recovery values).

- **0** Data flow or reporting scheme from collection of raw data through storage of validate concentrations; a flow chart is usually needed.

- **0** Key individuals who will handle the data in this reporting scheme (if this has already been described under project organization and responsibilities, it need not be repeated here).

The Quality Assurance Program Plan (QAPP) shall present methods of valiging and reducing data which can be used in preparing this element of the QAPP. In general, data reduction shall consist of the following essential tasks:

- **0** Accuracy

  Computing percent recoveries for spiked samples

Calculating the standard deviation in the overall average recovery value
Applying Chauvenet's criterion for detecting bad recovery data
Determining the range of uncertainty at a given level of confidence including sampling bias error.
Adjusting the laboratory data to correct any systematic errors (bias) that are discovered.

- Precision
  Examining split samples and pairs of samples for differences in inter- and intra-sample scatter
  Validating data on groups of samples, all of which shall have the same composition, by examining the scatter in each group in comparison to the overall scatter (invalid data are discarded)
  Computing an overall relative standard deviation that is applicable to all the field investigation data from the particular sampling campaign.

- Completeness
  Computing the fraction of quality assurance test data that remains valid after discarding any invalid accuracy or precision data.

- Representativeness and Comparability
  Determining whether these terms have meaning within the project framework
  Identifying the appropriate statistical methods
  Correctly applying the statistical methods and reporting the results.

If a blank sample is reported to contain a quantifiable concentration of any pollutant, the pollutant shall be deleted from the data reduction process and the Site Manager shall try to identity the cause. Particular attention shall be given to examining the protocol for blank preparation and consulting the supplier from which the sample containers were obtained.

If a valid reason for "nonzero" blanks is identified, an attempt shall be made to determine if previously obtained data can be validated or if a new field sampling program shall be structured that compensates for the nonzero blanks.

(11) Quality Control Checks. This section shall describe and/or reference all specific quality control methods to be followed. Examples of control checks to be considered include the following:

Replicates	Spiked samples/split samples
Internal standards	Blanks
Quality control samples	Zero and span gases
Calibration standards and devices	Surrogate samples/ reagent checks

Many of these methods will be described in the SOPs. More information and guidance for the selection of these checks are found in the following references:

- **0** Handbook for Analytical Quality Control and Radioactivity Analytical Laboratories, EPA-600/7-77-088. August 1977.
- **0** Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA 600/4-79-019.
- **0** Manual for Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples. EPA-600/l-79-008. January 1979.
- **0** EPA Technical Monographs Nos. 15 to 22.

(12) Performance and System Audits, Each QAPP shall describe the internal and external systems and performance audits required to monitor the capability and performance of the sampling and laboratory programs. The system audit shall consist of a careful evaluation of both field and laboratory quality control procedures to determine their proper selection and use.

System audits are normally performed either before or shortly after systems are operational and on a regularly scheduled basis during the lifetime of the project or continuing operation. The on-site system audit may be a requirement for formal laboratory certification programs, such as laboratories analyzing public drinking water systems. Specific references pertinent to systems audits for formal laboratory certification programs can be found in the following documents:

- **0** Procedure for the Evaluation of Environmental Monitoring Laboratories. EPA-600/4-78-017. March 1978.
- **0** Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supply - Criteria and Procedures. EPA-600/8-78-008. August 1978.

After the project is operational and generating data, performance audits shall be conducted periodically to determine the accuracy of the total sampling and laboratory programs or their component parts. The URS Team shall conduct field audits of sampling procedures to evaluate performance.

(13) Preventive Maintenance. The following preventive maintenance items shall be considered and addressed in the QAPP:

- **0** Schedule of important preventive maintenance tasks that shall be carried out to minimize down time of field equipment.
- **0** List of any critical spare parts that shall be on hand to minimize down time.

Procedures for preventive maintenance for field equipment shall be provided in SOPS.

(14) Specific Routine Procedures Used to Assess Data Precision Accuracy. Comparability. Representativeness and Completeness. The QAPP shall describe the routine procedures used to assess the measurement data. These procedures shall include the equations to calculate precision, accuracy, and completeness, and the methods used to gather data for the precision and accuracy calculations. Statistical procedures are found in the references listed below.

- o QA handbook for Pollution Measurement Systems. Volume I - Principles. EPA-600/9-76-005. March 1976.
- o QA Handbook for Air Pollution Measurement Systems. Volume II - Ambient Air Specific Methods. EPA-6004-77-027a. May 1977.
- o QA Handbook for Air Pollution Measurement Systems. Volume III - Stationary Source Methods. EPA-6004-77-027b. August 1977.
- o Handbook for Analytical Quality Control and Radioactivity Analytical Laboratories. EPA-6007/7-77-088. August 1977.
- o Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples. EPA-600/1-79-008. January 1979.
- o Calculation of Data Quality Indicators. EMSC RTP and Las Vegas USEPA.

- **0** Environmental Measurement Method Performance Data for Establishing Achievable Data Quality Goals. USEPA. 1983.

Examples of these procedures include:

- **0** Central tendency and dispersion measures
  Arithmetic mean
  Range
  Standard deviation
  Relative standard deviation
  Pooled standard deviation
  Geometric mean

- **0** Measures of variability
  Accuracy
  Bias
  Precision, interlaboratory and intralaboratories

- **0** Significance tests
  u-test
  f-test
  Chi-tsquare test

- **0** Confidence tests

- **0** Testing for outliers

This section shall specify any standard data assessment done by subcontract laboratories as well as how the results are to be shown in the quality assurance reports from the laboratories.

(15) Corrective Action. This section of the QAPP shall include the following elements.

- **0** Predetermined limits for data acceptability beyond which corrective action is required.

- **0** Procedures for corrective action.

- **0** Identification of the individual responsible for initiating the corrective action and the individual responsible for approving the corrective action, if necessary.

(16) Quality Assurance Reports to Management. QAPPs shall outline a system for periodic reporting to management on the performance of sample collection and data quality. As a minimum, these reports shall include:

- **0** Periodic assessment of measurement data accuracy, precision, representativeness, and completeness.
- **0** Results of performance audits.
- **0** Results of systems audits.
- **0** Significant quality assurance problems and recommended solutions.